HITACHI

No. 0105

CL2554AN
CL2854AN

SERVICE MANUAL
MANUEL D'ENTRETIEN
WARTUNGSHANDBUCH

CAUTION:
Before servicing this chassis, it is important that the service technician read the "Safety Precautions" and "Product Safety Notices" in this service manual.

ATTENTION:
Avant d'effectuer l'entretien du châassis, le technicien doit lire les «Précautions de sécurité» et les «Notices de sécurité du produit» présentés dans le présent manuel.

VORSICHT:
Vor Öffnen des Gehäuses hat der Service-Ingenieur die „Sicherheitshinweise" und „Hinweise zur Produktsicherheit" in diesem Wartungshandbuch zu lesen.

Data contained within this Service manual is subject to alteration for improvement.

Les données fournies dans le présent manuel d'entretien peuvent faire l'objet de modifications en vue de perfectionner le produit.

Die in diesem Wartungshandbuch enthaltenen Spezifikationen können sich zwecks Verbesserungen ändern.

December 1999

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1-1 Specifications

TV standard	PAL - SECAM B/G D/K, PAL I/I, SECAM L/L'
Sound system	NICAM B/G, I, D/K, L, FM 2Carrier B/G, D/K
Power consumption	21" : 49 W approx. 28" : 75 W approx.
Sound Output Power	21" : 4.5W x 2 (at 60% mod, 10%THD) 28" : 7W x 2 (at 60% mod, 10%THD)
Speaker	20", 21" : 7W 8 ohm x2 25", 28" : 12W 8 ohm x2
Teletext system	10 pages memory FASTEXT (FLOF or TOP)
Aerial input	75 ohm unbalanced
Channel coverage	Off-air channels, S-cable channels and hyperband
Tuning system	frequency synthesiser tuning system
Visual screen size	20" : 48 cm 21" : 51 cm 25" : 59 cm 28" : 66 cm
Channel indication	On Screen Display
Program Selection	100 programmes
Aux. terminal	EURO-SCART 1 : Audio / Video In and Out, R/G/B In, Slow and Fast switching. EURO-SCART 2 : Audio / Video In, SVHS In. Audio-Video Jack on front of cabinet in common connection with EURO-SCART 2. Headphone jack (3.5 mm) on front of cabinet
Remote Control Unit	R-40A01

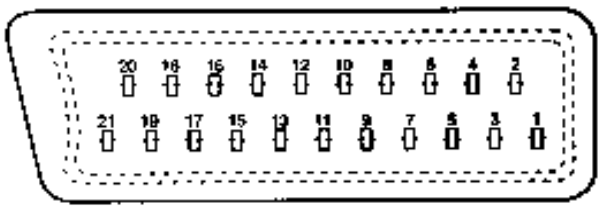
21 Pin EURO-SCART 1 :

Pin	Signal Description	Matching value
1	Audio Output Right	0.5 Vrms, Impedance < 1 kΩ, (RF 54% Mod)
2	Audio Input Right	0.5 Vrms, Impedance > 10 kΩ
3	Audio Output Left	0.5 Vrms, Impedance < 1 kΩ, (RF 54% Mod)
4	Audio Earth	
5	Blue Earth	
6	Audio Input Left	0.5 Vrms, Impedance > 10 kΩ
7	Blue Input	0.7 Vpp ±0.1V, Impedance 75Ω
8	Slow Switching	TV : 0 to 2V, AV 16/9 : 4.5 to 7V, AV 4/3 : 9.5 to 12V , Impedance > 10 kΩ
9	Green Earth	
10	N.C.	
11	Green Input	0.7 Vpp ± 0.1V, Impedance 75Ω
12	N.C.	
13	Red Earth	

14	Blanking Earth	
15	Red Input	0.7 Vpp ± 0.1V, Impedance 75Ω
16	Fast Switching	0 to 0.4V : Logic "0", 1 to 3V : Logic "1", Impedance 75Ω
17	Video Out Earth	
18	Video In Earth	
19	Video Output	1 Vpp ± 3dB, Impedance 75Ω
20	Video Input	1 Vpp ± 3dB, Impedance 75Ω
21	Common Earth	

21 Pin EURO-SCART 2 :

Pin	**Signal Description**	**Matching value**
1	N.C.	
2	Audio Input Right	0.5 Vrms, Impedance > 10 kΩ
3	N.C.	
4	Audio Earth	
5	Earth	
6	Audio Input Left	0.5 Vrms, Impedance > 10 kΩ
7	N.C.	
8	N.C.	
9	N.C.	
10	N.C.	
11	N.C.	
12	N.C.	
13	Earth	
14	Earth	
15	Chroma Input	± 3dB for a luminance signal of 1 Vpp
16	N.C.	
17	Earth	
18	Video In Earth	
19	N.C.	
20	Video Input, Y In.	1 Vpp ± 3dB, Impedance 75Ω
21	Common Earth	



1-2 Channel table

FREQUENCY TABLE

CH	EUROPE CCIR	FRANCE	GB(IRELAND)	EAST OIRT
C01	46.25	47.75 (L')	45.75	49.75
C02	48.25	55.75 (L')	53.75	59.25
C03	55.25	60.5 (L')	61.75	77.25
C04	62.25	63.75 (L')	175.25	85.25
C05	175.25	176.00	183.25	93.25
C06	182.25	184.00	191.25	175.25
C07	189.25	192.00	199.25	183.25
C08	196.25	200.00	207.25	191.25
C09	203.25	208.00	215.25	199.25
C10	210.25	216.00	223.25	207.25
C11	217.25	189.25 (LUX)	231.25	215.25
C12	224.25	69.25 (L')	239.25	223.25
C13	53.75	76.25 (L')	247.25	-
C14	-	83.25 (L')	49.75	-
C15	82.25	90.25	57.75	-
C16	-	97.25	65.75	-
C17	183.75	-	77.75	-
C18	192.25	-	85.75	-
C19	201.25	-	-	-
C20	-	-	-	-
C21	471.25	471.25	471.25	471.25
C22	479.25	479.25	479.25	479.25
C23	487.25	487.25	487.25	487.25
C24	495.25	495.25	495.25	495.25
C25	503.25	503.25	503.25	503.25
C26	511.25	511.25	511.25	511.25
C27	519.25	519.25	519.25	519.25
C28	527.25	527.25	527.25	527.25
C29	535.25	535.25	535.25	535.25
C30	543.25	543.25	543.25	543.25
C31	551.25	551.25	551.25	551.25
C32	559.25	559.25	559.25	559.25
C33	567.25	567.25	567.25	567.25
C34	575.25	575.25	575.25	575.25
C35	583.25	583.25	583.25	583.25
C36	591.25	591.25	591.25	591.25
C37	599.25	599.25	599.25	599.25
C38	607.25	607.25	607.25	607.25
C39	615.25	615.25	615.25	615.25
C40	623.25	623.25	623.25	623.25
C41	631.25	631.25	631.25	631.25
C42	639.25	639.25	639.25	639.25
C43	647.25	647.25	647.25	647.25
C44	655.25	655.25	655.25	655.25
C45	663.25	663.25	663.25	663.25

C46	671.25	671.25	671.25	671.25
C47	679.25	679.25	679.25	679.25
C48	687.25	687.25	687.25	687.25
C49	695.25	695.25	695.25	695.25
C50	703.25	703.25	703.25	703.25
C51	711.25	711.25	711.25	711.25
C52	719.25	719.25	719.25	719.25
C53	727.25	727.25	727.25	727.25
C54	735.25	735.25	735.25	735.25
C55	743.25	743.25	743.25	743.25
C56	751.25	751.25	751.25	751.25
C57	759.25	759.25	759.25	759.25
C58	767.25	767.25	767.25	767.25
C59	775.25	775.25	775.25	775.25
C60	783.25	783.25	783.25	783.25
C61	791.25	791.25	791.25	791.25
C62	799.25	799.25	799.25	799.25
C63	807.25	807.25	807.25	807.25
C64	815.25	815.25	815.25	815.25
C65	823.25	823.25	823.25	823.25
C66	831.25	831.25	831.25	831.25
C67	839.25	839.25	839.25	839.25
C68	847.25	847.25	847.25	847.25
C69	855.25	855.25	855.25	855.25
C70	863.25	863.25	863.25	863.25
C71	69.25	-	-	-
C72	76.25	-	-	-
C73	83.25	-	-	-
C74	90.25	-	-	-
C75	97.25	-	-	-
C76	59.25	-	-	-
C77	93.25	-	-	-
S01	105.25	104.75	103.25	105.25
S02	112.25	116.75	111.25	112.25
S03	119.25	128.75	119.25	119.25
S04	126.25	140.75	127.25	126.25
S05	133.25	152.75	135.25	133.25
S06	140.25	164.75	143.25	140.25
S07	147.25	176.75	151.25	147.25
S08	154.25	188.75	159.25	154.25
S09	161.25	200.75	167.25	161.25
S10	168.25	212.75	-	168.25
S11	231.25	224.75	-	231.25
S12	238.25	236.75	-	238.25
S13	245.25	248.75	255.25	245.25
S14	252.25	260.75	263.25	252.25
S15	259.25	272.75	271.25	259.25
S16	266.25	284.75	279.25	266.25
S17	273.25	296.75	287.25	273.25
S18	280.25	136.00	295.25	280.25

S19	287.25	160.00	303.25	287.25
S20	294.25	-	-	294.25
S21	303.25	303.25	-	303.25
S22	311.25	311.25	311.25	311.25
S23	319.25	319.25	319.25	319.25
S24	327.25	327.25	327.25	327.25
S25	335.25	335.25	335.25	335.25
S26	343.25	343.25	343.25	343.25
S27	351.25	351.25	351.25	351.25
S28	359.25	359.25	359.25	359.25
S29	367.25	367.25	367.25	367.25
S30	375.25	375.25	375.25	375.25
S31	383.25	383.25	383.25	383.25
S32	391.25	391.25	391.25	391.25
S33	399.25	399.25	399.25	399.25
S34	407.25	407.25	407.25	407.25
S35	415.25	415.25	415.25	415.25
S36	423.25	423.25	423.25	423.25
S37	431.25	431.25	431.25	431.25
S38	439.25	439.25	439.25	439.25
S39	447.25	447.25	447.25	447.25
S40	455.25	455.25	455.25	455.25
S41	463.25	463.25	463.25	463.25

1-3 ATSS sorting method

The TV set sweeps all the TV bands from beginning of VHF to end of UHF. The TV controlling software for each program checks if a VPS CNI code is transmitted. If no VPS CNI code is found, the system check if a CNI code is transmitted in the teletext lines (Packet 8/30 format 1). If such a code (VPS or teletext) is found and if this code is in the ATSS list, the program is automatically named.
The programs found are then sorted in 4 groups :

Group I : It contains all the programs from the selected country and named by the TV controlling software. Within this group the sorting order is fixed by the ATSS list.
Group II : It contains all the programs with a strong signal strength which are not listed in group I.
Group III : It contains all the programs with a weak signal strength which are not listed in group I.
Group IV : If two or more programs with the same code are found, only the strongest (or if they have the same level the one with the lowest frequency) is listed in group I, II or III. The others are listed in group IV. Note : If two programs with the same name but a different code are found these two programs are listed in group I, II or III (e.g. Regional program SW3 in Germany).

The sorting order within group II, III, and IV is based on the channel frequency. The program with the lowest frequency is allocated the first rank in its group, and so forth until the last program of the group which has the highest frequency.

Program number	Group	Skip
1	Group I	
2		
...		
n		
n+1	Group II	
...		
m		
m+1	Group III	
...		
p		
p+1	Group IV	↳
...		
q		
q+1	not used	↳
...		
99		
0		

Program number	Group	Skip
1	Group II	
...		
m		
m+1	Group III	
...		
p		
p+1	Group IV	↳
...		
q		
q+1	not used	↳
...		
99		
0		

Special case : **Country selection = Others**

Special case : **France**
If France is selected the TV controlling software sweeps the whole TV bands firstly with France system selected (positive video modulation) and secondly with Europe system selected (negative video modulation).

Special case : **Switzerland**
If Switzerland is selected the TV controlling software sweeps the whole TV bands firstly with Europe system selected (negative video modulation) and secondly with France system selected (positive video modulation).

Special case : **GB**
Note for satellite receiver users : Before starting ATSS turn On your satellite receiver and tune " SKY NEWS ".
If GB is selected the TV controlling software seeks for programs only in UHF (C21 to C70). The sorting order is :
1 - BBC1
2 - BBC2
3 - ITV
4 - CH4
5 - CH5
6 - NEWS

If two or more " identical "programs (same name but different code e.g. BBC1 and BBC1 Scotland) are found the following programs in the list will be shifted up. (1 - BBC1, 2 - BBC1, 3 - BBC2, 4 - ITV, 5 - CH4, 6 - CH5, 7 - NEWS, ..)

If one of the program above is not found, the associated program number remains empty (freq.=467.25 Mhz - Skip selected - no name - system=GB).
example A : 1 - BBC1, 2 - BBC2, 3 - ITV, 4 - -----, 5 - CH5, 6 - NEWS, ...
example B (if 2 BBC1 found) : 1 - BBC1, 2 - BBC1, 3 - BBC2, 4 - ITV, 5 - -----, 6 - CH5, 7 - NEWS, ...

2 - Safety instruction

WARNING: Only competent service personnel may carry out work involving the testing or repair of this equipment.

X-RAY RADIATION PRECAUTION

1. Excessive high voltage can produce potentially hazardous X-RAY RADIATION. To avoid such hazards, the high voltage must not exceed the specified limit. The nominal value of the high voltage of this receiver is 25-26 KV (20”-21”) or 26 KV (25” - 28”) at max beam current. The high voltage must not, under any circumstances, exceed 27.5 KV (20”), 29KV (21”), 29.5 KV (25") or 30 KV (28"). Each time a receiver requires servicing, the high voltage should be checked. It is important to use an accurate and reliable high voltage meter.
2. The only source of X-RAY Radiation in this TV receiver is the picture tube. For continued X-RAY RADIATION protection, the replacement tube must be exactly the same type tube as specified in the parts list.

SAFETY PRECAUTION

1. Potentials of high voltage are present when this receiver is operating. Operation of the receiver outside the cabinet or with the back board removed involves a shock hazard from the receiver.
   1) Servicing should not be attempted by anyone who is not thoroughly familiar with the precautions necessary when working on high voltage equipment.
   2) Discharge the high potential of the picture tube before handling the tube. The picture tube is highly evacuated and if broken, glass fragments will be violently expelled.
2. If any Fuse in this TV receiver is blown, replace it with the FUSE specified in the Replacement Parts List.
3. When replacing a high wattage resistor (oxide metal film resistor) in circuit board, keep the resistor 10 mm away from circuit board.
4. Keep wires away from high voltage or high temperature components.
5. This receiver must operate under AC 230 volts, 5O Hz. NEVER connect to DC supply or any other power or frequency.

PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in this equipment have special safety-related characteristics. These characteristics are often passed unnoticed by a visual inspection and the X-RAY RADIATION protection afforded by them cannot necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this manual and its supplements, electrical components having such features are identified by designated symbol on the parts list. Before replacing any of these components, read the parts list in this manual carefully. The use of substitutes replacement parts which do not have the same safety characteristics as specified in the parts list may create X-RAY Radiation.

3 - Alignment instructions

3-1 Microcontroller configuration : Service mode
To switch the TV set into service mode please see instruction below.

1 - Select pr. number 91
2 - Adjust sharpness to minimum and exit all menu.
3 - Quickly press the key sequence : **RED - GREEN - menu**

To exit SERVICE menu press **menu** key or **Std By** key.

In Service Mode press "**OK**" to stop the microcontroller i.e. the I2C bus is free and the set can be controlled by external equipment. Press "**OK**" again to allow the microcontroller to control the set again

3-2 Microcontroller configuration : Option

Option	Tuner maker	Cut off / Video Amp.
0	DAEWOO / SAMSUNG	140V / 92V
1	DAEWOO / SAMSUNG	
2	SIEL	140V / 92V

3-3 TV set Alignment
3-3-1 - G2 alignment
- TV in AV mode without video signal ⇒ Black screen.
- TV pre-set with WP Red, WP Green and WP Blue equal to 32.
- TV pre-set with Black R, Black G equal to 8.
- Set TV in NORMAL I mode
- Adjust screen volume (on FBT) such that the highest cathode cut-off voltage measured on CRT board, is V cut off ± 5V.

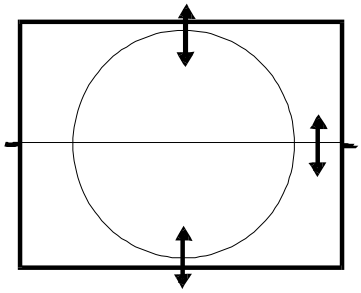
Screen size	V cut-off
20" & 21"	125 V
25" & 28"	140 V

3-3-2 - White balance
- Select a dark picture and adjust Black G and Black R to the desired colour temperature.
- Select a bright picture and adjust WP Red, WP Green, WP Blue to the desired colour temperature.

3-3-3 - Focus
- Adjust the Focus volume (on FBT) to have the best resolution on screen.

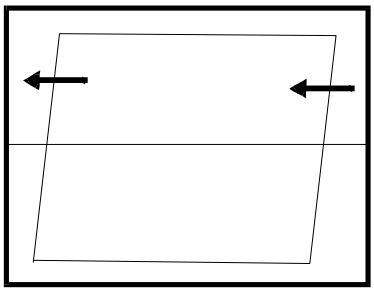
3-3-4 - Vertical geometry

- Adjust the Vertical Amplitude, Shift, S-Correction and Slope to compensate for vertical distortion.

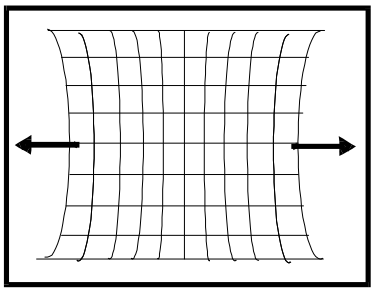


3-3-5 - Horizontal picture centring
- Adjust H Shift to have the picture in the centre of the screen.

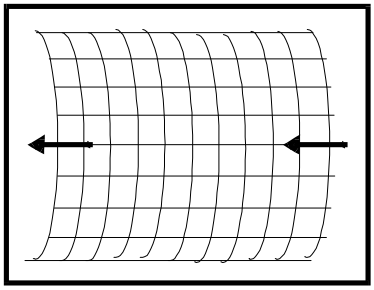
3-3-6 - East / West correction
- Adjust the H Parall, H Bow, H Width, EW Parabo, Up Corner, Dw Corner, EW trapez to compensate for geometrical distortion.



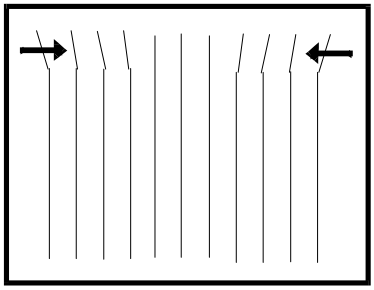
H. Parall



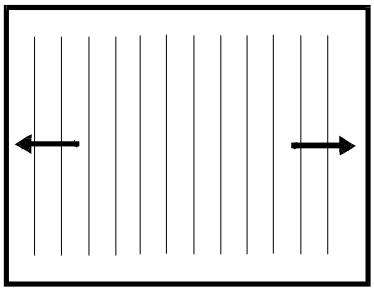
EW.Parabo



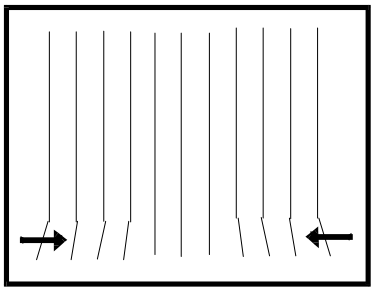
H. Bow



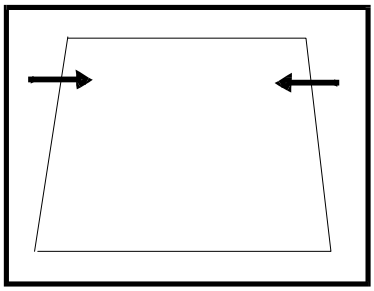
Up Corner



H.Width



Dw Corner



EW Trapez

3-3-7 - AGC

- Adjust the antenna signal level at 68 dBµV± 2 (UHF - CH25)
- Set RF AGC to 0.
- Increase RF AGC level and stop when the level on pin 6 of TDA936x goes below 2.5 Vdc

4 - IC description

4-1 TDA936x TV signal processor - Teletext decoder with embedded μ-Controller.

TV-signal Processor

- Multistandard vision IF circuit with alignment-free PLL demodulator
- Internal (switchable) time-constant for the IF-AGC circuit
- Source selection between 'Internal' CVBS and external CVBS or Y/C signals
- Integrated chrominance trap circuit
- Integrated luminance delay line with adjustable delay time
- Asymmetrical ‘delay line type’ peaking in the luminance channel
- Black stretching for non-standard luminance signals
- Integrated chroma band-pass filter with switchable centre frequency
- Only one reference (12 MHz) crystal required for the μ-Controller, Teletext and the colour decoder
- PAL / NTSC or multistandard colour decoder with automatic search system
- Internal base-band delay line
- RGB control circuit with 'Continuous Cathode Calibration', white point and black level off set adjustment so that the colour temperature of the dark and the bright parts of the screen can be chosen independently.
- Linear RGB or YUV input with fast blanking for external RGB/YUV sources. The Text/OSD signals are internally supplied from the μ-Controller/Teletext decoder
- Contrast reduction possibility during mixed-mode of OSD and Text signals
- Horizontal synchronisation with two control loops and alignment-free horizontal oscillator
- Vertical count-down circuit
- Vertical driver optimised for DC-coupled vertical output stages
- Horizontal and vertical geometry processing
- Horizontal and vertical zoom function for 16 : 9 applications
- Horizontal parallelogram and bow correction for large screen picture tubes

μ-Controller

- 80C51 μ-controller core standard instruction set and timing
- 1μs machine cycle
- 32 - 128Kx8-bit late programmed ROM
- 3 - 12Kx8-bit Auxiliary RAM (shared with Display and Acquisition)
- Interrupt controller for individual enable/disable with two level priority
- Two 16-bit Timer/Counter registers
- WatchDog timer
- Auxiliary RAM page pointer
- 16-bit Data pointer
- IDLE and Power Down (PD) mode
- 14 bits PWM for Voltage Synthesis Tuning
- 8-bit A/D converter
- 4 pins which can be programmed as general I/0 pin, ADC input or PWM (6-bit) output

Data Capture

- Text memory 10 pages
- Inventory of transmitted Teletext pages stored in the Transmitted Page Table (TPT) and Subtitle Page Table (SPT)

- Data Capture for US Closed Caption
- Data Capture for 525/625 line WST, VPS (PDC system A) and Wide Screen Signalling (WSS) bit decoding Automatic selection between 525 WST/625 WST
- Automatic selection between 625 WST/VPS on line 16 of VBI
- Real-time capture and decoding for WST Teletext in Hardware, to enable optimised µ-processor throughput
- Automatic detection of FASTEXT transmission
- Real-time packet 26 engine in Hardware for processing accented, G2 and G3 characters
- Signal quality detector for video and WST/VPS data types
- Comprehensive teletext language coverage
- Full Field and Vertical Blanking Interval (VBI) data capture of WST data

Display

- Teletext and Enhanced OSD modes
- Features of lever 1.5 WST and US Close Caption
- Serial and Parallel Display Attributes
- Single/Double/Quadruple Width and Height for characters
- Scrolling of display region
- Variable flash rate controlled by software
- Enhanced display features including overlining, underlining and italics
- Soft colours using CLUT with 4096 colour palette
- Globally selectable scan lines per row (9/10/13/16) and character matrix [12x10, 12xl3, 12x16 (VxH)]
- Fringing (Shadow) selectable from N-S-E-W direction
- Fringe colour selectable
- Meshing of defined area
- Contrast reduction of defined area
- Cursor
- Special Graphics Characters with two planes, allowing four colours per character
- 32 software re-definable On-Screen display characters
- 4 WST Character sets (GO/G2) in single device (e.g. Latin, Cyrillic, Greek, Arabic)
- G1 Mosaic graphics, Limited G3 Line drawing characters
- WST Character sets and Closed Caption Character set in single device

Data Capture

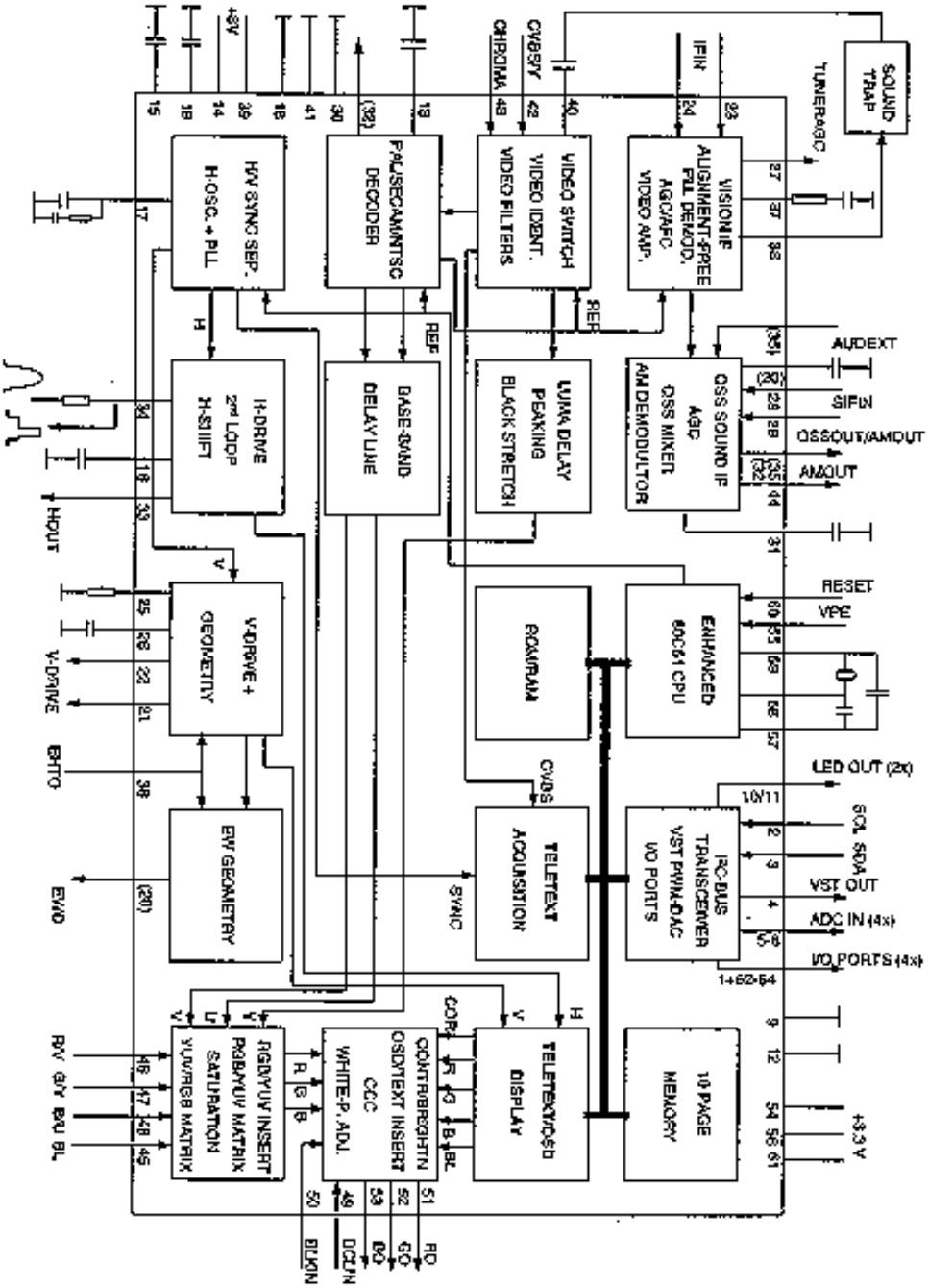
The Data Capture section takes in the analogue Composite Vidéo and Blanking Signal (CVBS), and from this extracts the required data, which is then decoded and stored in memory.

The extraction of the data is performed in the digital domain. The first stage is to convert the analogue CVBS signal into a digital form. This is done using an ADC sampling at 12MHz. The data and clock recovery is then performed by a Multi-Rate Video Input Processor (MuIVIP). From the recovered data and clock the following data types are extracted WST Teletext (625/525), Closed Caption, VPS, WSS. The extracted data is stored in either memory (DRAM) via the Memory Interface or in SFR locations.

Data Capture Features

- Video Signal Quality detector

- Data Capture for 625 line WST
- Data Capture for 525 line WST
- Data Capture for US Closed Caption
- Data Capture for VPS data (PDC system A)
- Data Capture for Wide Screen Signalling (WSS) bit decoding
- Automatic selection between 525 WST/625WST
- Automatic selection between 625WST/VPS on line 16 of VBI
- Real-time capture and decoding for WST Teletext in Hardware, to enable optimised microprocessor throughput
- 10 pages stored On-Chip
- Inventory of transmitted Teletext pages stored in the Transmitted Page Table (TPT) and Subtitle Page Table (SPT)
- Automatic detection of FASTEXT transmission
- Real-time packet 26 engine in Hardware for processing accented, G2 and G3 characters
- Signal quality detector for WST/VPS data types
- Comprehensive Teletext language coverage
- Full Field and Vertical Blanking Interval (VBI) data capture of WST data


SOUND TRAP
TUNER AGC
IFIN
CVBS/Y
CHROMA
VISION IF ALIGNMENT-FREE PLL DEMOD. AGC/AFC VIDEO AMP.
VIDEO SWITCH VIDEO IDENT. VIDEO FILTERS
PAL/SECAM/NTSC DECODER
H/V SYNC SEP. H-OSC. + PLL
H-DRIVE 2nd LOOP H-SHIFT
BASE-BAND DELAY LINE
LUMA DELAY PEAKING BLACK STRETCH
QSS SOUND IF AGC QSS MIXER AM DEMODULATOR
AUDEXT
SIFIN
QSSOUT/AMOUT
AMOUT
HOUT
V-DRIVE+ GEOMETRY
V-DRIVE
EW GEOMETRY
EW/D
EHTO
ROM/RAM
ENHANCED 80C51 CPU
RESET
VPE
LED OUT (2x)
SCL SDA
VST OUT
ADC IN (4x)
I/O PORTS (4x)
I²C-BUS TRANSCEIVER VST PWM-DAC I/O PORTS
TELETEXT ACQUISITION
SYNC
TELETEXT/OSD DISPLAY
10 PAGE MEMORY
RGB/YUV INSERT PAL/YUV MATRIX SATURATION YUV/RGB MATRIX
CONTRAST/BRIGHTN OSD/TEXT INSERT CCC WHITE-P. ADJ.
RO GO BO DCLIN
BLKIN
+3.3 V

TV processor version and µ-Controller capacity

IC version	TDA9365 Nx / 3	TDA9367 Nx / 3
TV range	110°	90°
QSS sound IF amplifier with separated input and AGC circuit		
PAL decoder		
SECAM decoder		
NTSC decoder		
Horizontal geometry (E-W)		
Horizontal and vertical zoom		
ROM size	64 k	64 k
RAM size	2 k	2 k
Teletext	10 pages	10 pages

IC marking and version

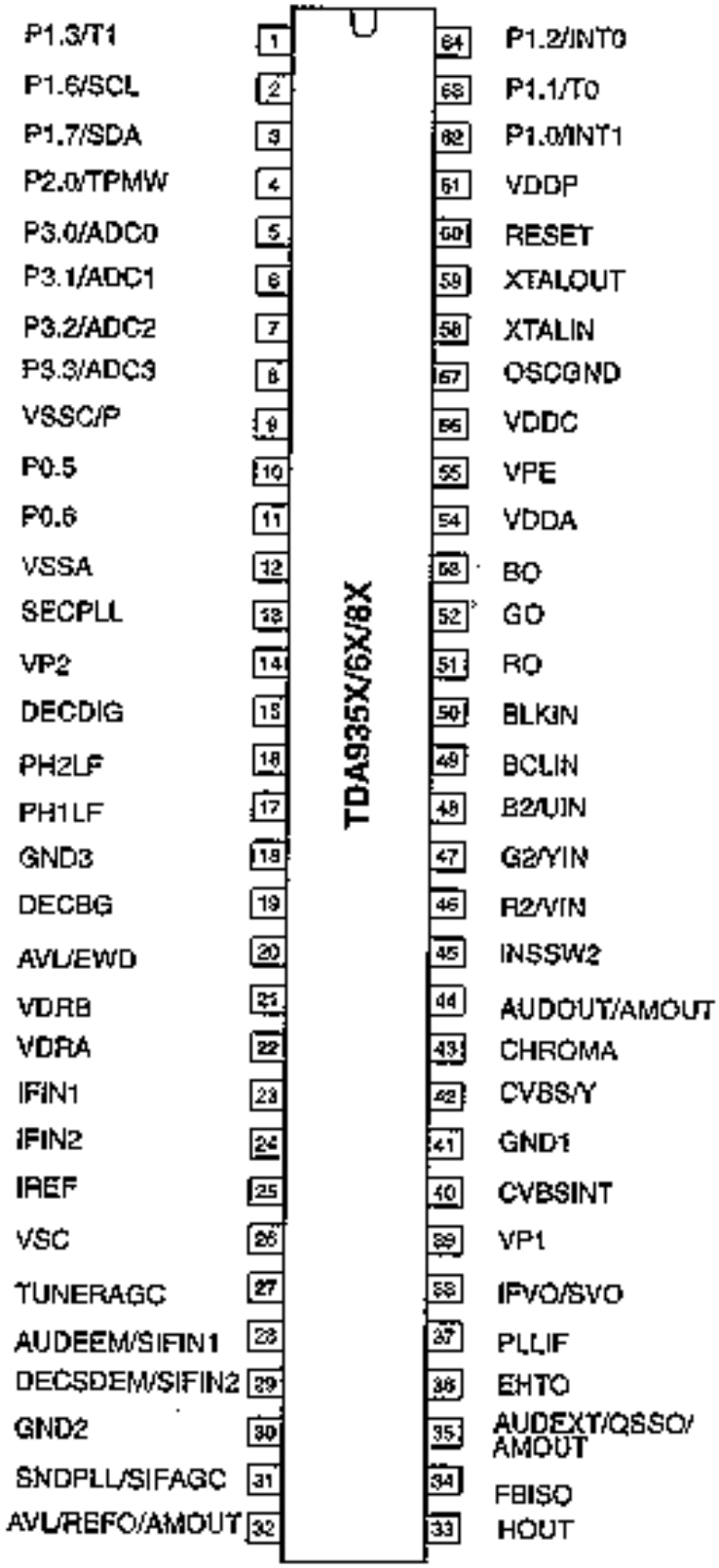
IC marking (line 3)	OSD languages	ATSS country	Text
DW9365/N1/3-BE x (note : x is the software version)	English, French, German, Italian, Spanish, Dutch, Danish, Finnish, Norwegian, Swedish	GB, France, Germany, Belgium, Spain, Italy, Switzerland, Austria, Denmark, Finland, Netherlands, Norway, Sweden, Ireland, Others	Pan-European (West)
DW9365/N1/3-BDx (note : x is the software version)	English, Polish, Russian, Hungarian, Czech, Slovakian, Romanian, Greek	Poland, Hungary, Czech rep., Others	Pan-European, East, Cyrillic, Greek.

PINNING

SYMBOL	PIN	DESCRIPTION
n.u.	1	Port 1.3 Not used.
SCL	2	I2C bus clock line
SDA	3	I2C Data line
SECAM L' out	4	Port 2.0 : High when L' selected (PushPull)
OCP	5	Port 3.0 : Over Current Protection
RF AGC in	6	ADC 1 : For factory use only (High impedance)
Key-in	7	ADC 2 : local key input (High impedance)
S/SW	8	ADC 3 : Scart Slow switching input (See XXX)
VssC/P	9	digital ground for µ-controller core and peripheral
LED 1	10	port 0.5 (8mA current sinking capability)

LED 2	11	port 0.6 (8mA current sinking capability)
VSSA	12	analogue ground of teletext decoder and digital ground of TV processor
SEC PLL	13	SECAM PLL decoupling
VP2	14	2nd supply voltage TV-processor
DECDIG	15	decoupling digital supply of TV-processor
PH2LF	16	phase-2 filter
PH1LF	17	phase-1 filter
GND3	18	ground 3 for TV-processor
DECBG	19	bandgap decoupling
AVL/EWD	20	East / West drive output
VDRB	21	vertical drive B output
VDRA	22	vertical drive A output
IFIN1	23	IF input 1
IFIN2	24	IF input 2
IREF	25	reference current input
VSC	26	vertical sawtooth capacitor
TUNERAGC	27	tuner AGC output
SIFIN1	28	SIF input 1
SIFIN2	29	SIF input 2
GND2	30	ground 2 for TV processor
SIF AGC	31	AGC sound IF
REF0	32	n.u.
HOUT	33	horizontal output
FBISO	34	flyback input / sandcastle output
QSS out	35	QSS intercarrier output
EHT0	36	EHT/Overvoltage protection
PLLIF	37	IF PLL loop filter
IFVO	38	IF video output
VP1	39	main supply voltage TV-processor
CVBSINT	40	internal CVBS input
GND1	41	ground 1 for TV-processor
CVBS/Y	42	external CVBS/Y input
CHROMA	43	chrominance input (SVHS)
AMOUT	44	n.u.
INSSW2	45	2nd RGB insertion input
R2IN	46	2nd R input
G2IN	47	2nd G input
B2IN	48	2nd B input
BCLIN	49	beam current limiter input
BLKIN	50	black current input
R0	51	RED Output
G0	52	GREEN Output
B0	53	BLUE Output
VDDA	54	analogue supply of Teletext decoder and digital supply of TV-Processor (3.3V)
VPE	55	OTP programming supply
VDDC	56	digital supply to core (3.3V)
OSCGND	57	oscillator ground supply
XTALIN	58	crystal oscillator input

XTALOUT	59	crystal oscillator output
RESET	60	reset
VDDP	61	digital supply to periphery (3.3V)
Audio Mute	62	Port 1.0 : Audio mute output (PushPull)
Power	63	Port 1.1 : Power output (PushPull)
IR in	64	Interrupt input 0 : R/C Infrared input


TDA935X/6X/8X
P1.3/T1 1
P1.6/SCL 2
P1.7/SDA 3
P2.0/TPMW 4
P3.0/ADC0 5
P3.1/ADC1 6
P3.2/ADC2 7
P3.3/ADC3 8
VSSC/P 9
P0.5 10
P0.6 11
VSSA 12
SECPLL 13
VP2 14
DECDIG 15
PH2LF 16
PH1LF 17
GND3 18
DECBG 19
AVL/EWD 20
VDRB 21
VDRA 22
IFIN1 23
IFIN2 24
IREF 25
VSC 26
TUNERAGC 27
AUDEEM/SIFIN1 28
DECSDEM/SIFIN2 29
GND2 30
SNDPLL/SIFAGC 31
AVL/REFO/AMOUT 32
64 P1.2/INT0
63 P1.1/T0
62 P1.0/INT1
61 VDDP
60 RESET
59 XTALOUT
58 XTALIN
57 OSCGND
56 VDDC
55 VPE
54 VDDA
53 BO
52 GO
51 RO
50 BLKIN
49 BCLIN
48 B2/UIN
47 G2/YIN
46 R2/VIN
45 INSSW2
44 AUDOUT/AMOUT
43 CHROMA
42 CVBS/Y
41 GND1
40 CVBSINT
39 VP1
38 IFVO/SVO
37 PLLIF
36 EHTO
35 AUDEXT/QSSO/AMOUT
34 FBISO
33 HOUT

4-2 MSP3415D Multistandard Sound Processor
The MSP 3415D is designed as a single-chip Multistandard Sound Processor for applications in analogue and digital TV sets, video recorders, and PC cards.

MSP 3415D features
- sound IF input
- No external filters required
- Stereo baseband input via integrated AD converters
- Two pairs of DA converters
- Two carrier FM or NICAM processing
- AVC : Automatic Volume Correction
- Bass, treble, volume processing
- Full SCART in/out matrix without restrictions
- Improved FM-identification
- Demodulator short programming
- Auto-detection for terrestrial TV - sound standards
- Precise bit-error rate indication
- Automatic switching from NICAM to FM/AM or vice versa
- Improved NICAM synchronisation algorithm
- Improved carrier mute algorithm
- Improved AM-demodulation
- Reduction of necessary controlling
- Less external components

Basic Features of the MSP 3415D

Demodulator and NICAM Decoder Section

The MSP 3415D is designed to simultaneously perform digital demodulation and decoding of NICAM-coded TV stereo sound, as well as demodulation of FM or AM mono TV sound. Alternatively, two carrier FM systems according to the German terrestrial specs can be processed with the MSP 3415D.

The MSP 3415D facilitates profitable multistandard capability, offering the following advantages:
- Automatic Gain Control (AGC) for analogue input: input range: 0.10 - 3 Vpp
- integrated A/D converter for sound-IF input
- all demodulation and filtering is performed on chip and is individually programmable
- easy realisation of all digital NICAM standards (B/G, I, L and D/K)
- FM-demodulation of all terrestrial standards (include identification decoding)
- no external filter hardware is required
- only one crystal clock (18.432 MHz) is necessary
- high deviation FM-mono mode (max. deviation: approx. ±360 kHz)

DSP-Section (Audio Baseband Processing)
- flexible selection of audio sources to be processed
- performance of terrestrial de-emphasise systems (FM, NICAM)
- digitally performed FM-identification decoding and de-matrixing
- digital baseband processing: volume, bass, treble

- simple controlling of volume, bass, treble

Analogue Section
- two selectable analogue pairs of audio baseband input (= two SCART inputs) input level: <2 V RMS,
input impedance: >25 kΩ
- one selectable analogue mono input (i.e. AM sound): Not used in this chassis
- two high-quality A/D converters, S/N-Ratio: >85 dB
- 20 Hz to 20 kHz bandwidth for SCART-to-SCART copy facilities
- loudspeaker: one pair of four-fold oversampled D/A converters
output level per channel: max. 1.4 VRMS output resistance: max. 5 kΩ
S/N-ratio: >85 dB at maximum volume max. noise voltage in mute mode: < 10 μV (BW: 20 Hz... 16 kHz)
- one pair of four-fold oversampled D/A converters supplying a pair of SCART-outputs.
output level per channel: max. 2 V RMS, output resistance: max. 0.5 kΩ,
S/N-Ratio: >85 dB (20 Hz... 16 kHz)

Application Fields of the MSP 3415D

In the following sections, a brief overview about the two main TV sound standards, NICAM 728 and German FM Stereo, demonstrates the complex requirements of a multistandard audio IC.

NICAM plus FM/AM-Mono

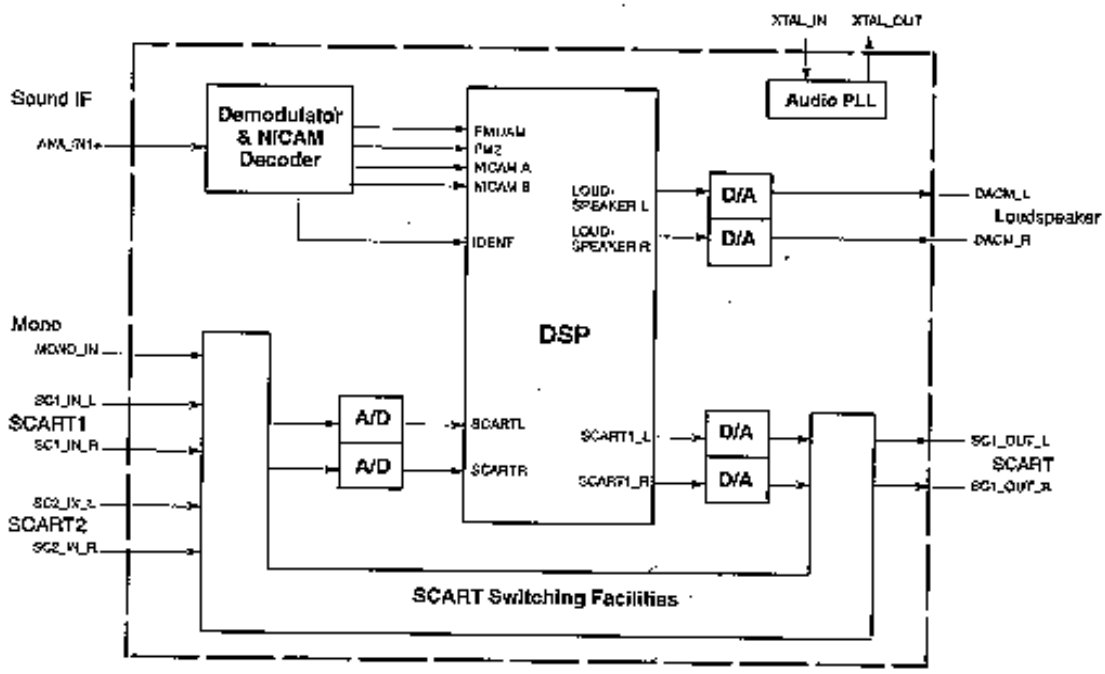
According to the British, Scandinavian, Spanish, and French TV-standards, high-quality stereo sound is transmitted digitally. The systems allow two high-quality digital sound channels to be added to the already existing FM/AM-channel. The sound coding follows the format of the so-called Near Instantaneous Companding System (NICAM 728). Transmission is performed using Differential Quadrature Phase Shift Keying (DQPSK. Table below offers an overview of the modulation parameters.
In the case of NICAM/FM (AM) mode, there are three different audio channels available: NICAM A, NICAM B, and FM/AM-mono. NICAM A and B may belong either to a stereo or to a dual language transmission. Information about operation mode and about the quality of the NICAM signal can be read by the controlling software via the control bus. In the case of low quality (high bit error rate), the controlling software may decide to switch to the analogue FM/AM-mono sound. Alternatively, an automatic NICAM-FM/AM switching may be applied.

German 2-Carrier System (DUAL FM System)
Since September 1981, stereo and dual sound programs have been transmitted in Germany using the 2-carrier system. Sound transmission consists of the already existing first sound carrier and a second sound carrier additionally containing an identification signal. More details of this standard are given in Tables below. For D/K very similar system is used.

TV standards

TV system	Position of sound carrier (MHz)	Sound modulation	Colour system	Country
B/G	5.5 / 5.7421875	FM Stereo	PAL	Germany

B/G	5.5 / 5.85	FM-Mono / NICAM	PAL	Scandinavia, Spain
L	6.5 / 5.85	AM - Mono / NICAM	SECAM-L	France
I	6.0 / 6.552	FM-Mono / NICAM	PAL	UK
D/K	6.5 / 6.2578125 D/K1 6.5 / 6.7421875 D/K2 6.5 / 5.85 D/K-NICAM	FM Stereo FM-Mono / NICAM	SECAM-East	USSR Hungary



Architecture of MSP3415D

Pin connections and short description

Pin No.	Pin Name	Type	Short description
1	TP	Out	Test pin
2	NC		Not Connected
3	NC		Not Connected
4	TP	Out	Test pin
5	TP	Out	Test pin
6	ADR_SEL	In	I2C bus Address select
7	STANDBYQ	In	Standby (Low-active)
8	NC		Not Connected
9	I2C_CL	In / Out	I2C Clock
10	I2C_DA	In / Out	I2C data
11	TP	In / Out	Test pin
12	TP	In / Out	Test pin
13	TP	Out	Test pin
14	NC		Not Connected

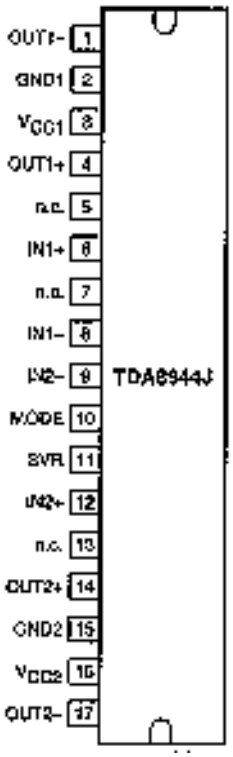
15	TP	Out	Test pin
16	TP	Out	Test pin
17	TP	Out	Test pin
18	DVSUP		Digital power supply +5V
19	DVSS		Digital Ground
20	NC		Not Connected
21	NC		Not Connected
22	NC		Not Connected
23	NC		Not Connected
24	RESETQ	In	Power-On-reset
25	NC		Not Connected
26	NC		Not Connected
27	VREF2		Reference ground 2 high voltage part
28	DACM_R	Out	Loudspeaker out Right
29	DACM_L	Out	Loudspeaker out Left
30	NC		Not Connected
31	TP	Out	Test pin
32	NC		Not Connected
33	NC		Not Connected
34	NC		Not Connected
35	VREF1		Reference ground 1 high voltage part
36	SC1_OUT_R	Out	Scart output 1, right
37	SC1_OUT_L	Out	Scart output 1, left
38	NC		Not Connected
39	AHVSUP		Analogue power supply 8.0V
40	CAPL_M		Volume capacitor MAIN
41	AHVSS		Analogue ground
42	AGNDC		Analogue reference voltage high voltage part
43	NC		Not Connected
44	NC		Not Connected
45	NC		Not Connected
46	NC		Not Connected
47	NC		Not Connected
48	ASG2		Analogue Shield Ground 2
49	SC2_IN_L	In	Scart input 2 in, left
50	SC2_IN_R	In	Scart input 2 in, right
51	ASG1		Analogue Shield Ground 1
52	SC1_IN_L	In	Scart input 1 in, left
53	SC1_IN_R	In	Scart input 1 in, right
54	VREFTOP		Reference voltage IF A/D converter
55	MONO_IN	In	Mono input
56	AVSS		Analogue ground
57	AVSUP		Analogue power supply
58	ANA_IN1+	In	IF input 1
59	ANA_IN1-	In	IF common
60	NC		Not Connected
61	TESTEN	In	Test pin
62	XTAL_IN	In	Crystal oscillator
63	XTAL_OUT	Out	Crystal oscillator

64	NC		Test pin

4-3 TDA894xJ Stereo Audio Amplifier

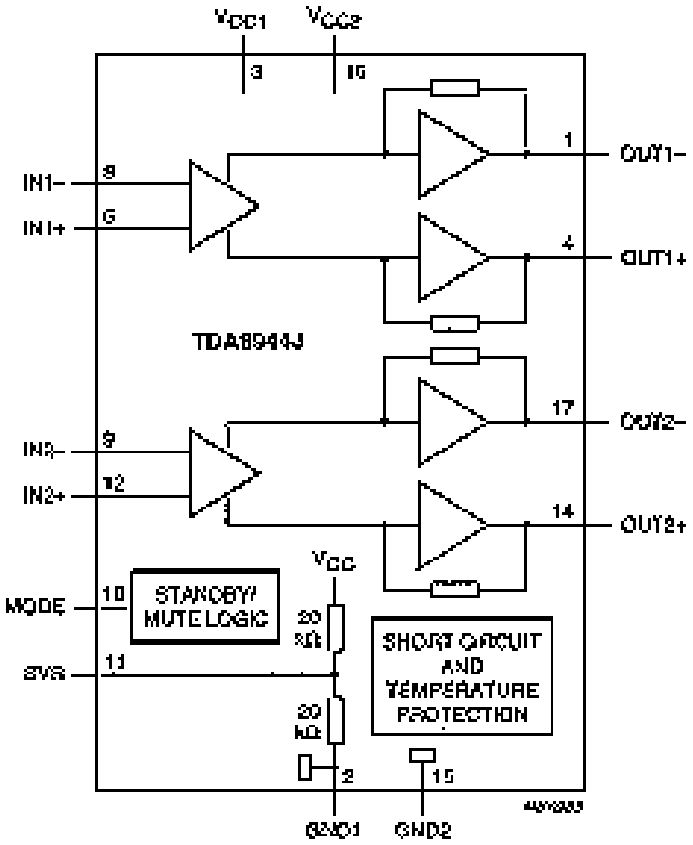
The TDA 8944J (TDA 8946J) is a dual-channel audio power amplifier with an output power of 2 x 7 W (2 x 15 W) at an 8 Ω load and a 12 V supply. The circuit contains two Bridges Tied Load (BTL) amplifiers with an all-NPN output stage and standby/mute logic. The TDA8944J comes in a 17-pin DIL power package.

Features
Few external components
Fixed gain
Standby and mute mode
No on/off switching plops
low standby current
High supply voltage ripple rejection
Outputs short-circuit protected to ground, supply and across the load
Thermally protected



Pin description

Pin	Symbol	Description
1	OUT1-	negative loudspeaker terminal 1
2	GND1	ground channel 1
3	Vcc1	supply voltage channel 1
4	OUT1+	positive loudspeaker terminal 1
5	n.c.	not connected
6	IN1+	positive input1
7	n.c.	not connected
8	IN1-	negative input1
9	IN2-	negative input2
10	MODE	mode selection input
11	SVR	half supply voltage decoupling (ripple rejection)
12	IN2+	positive input2



Block diagram TDA8944J

4-4 TDA835xJ Vertical Amplifier

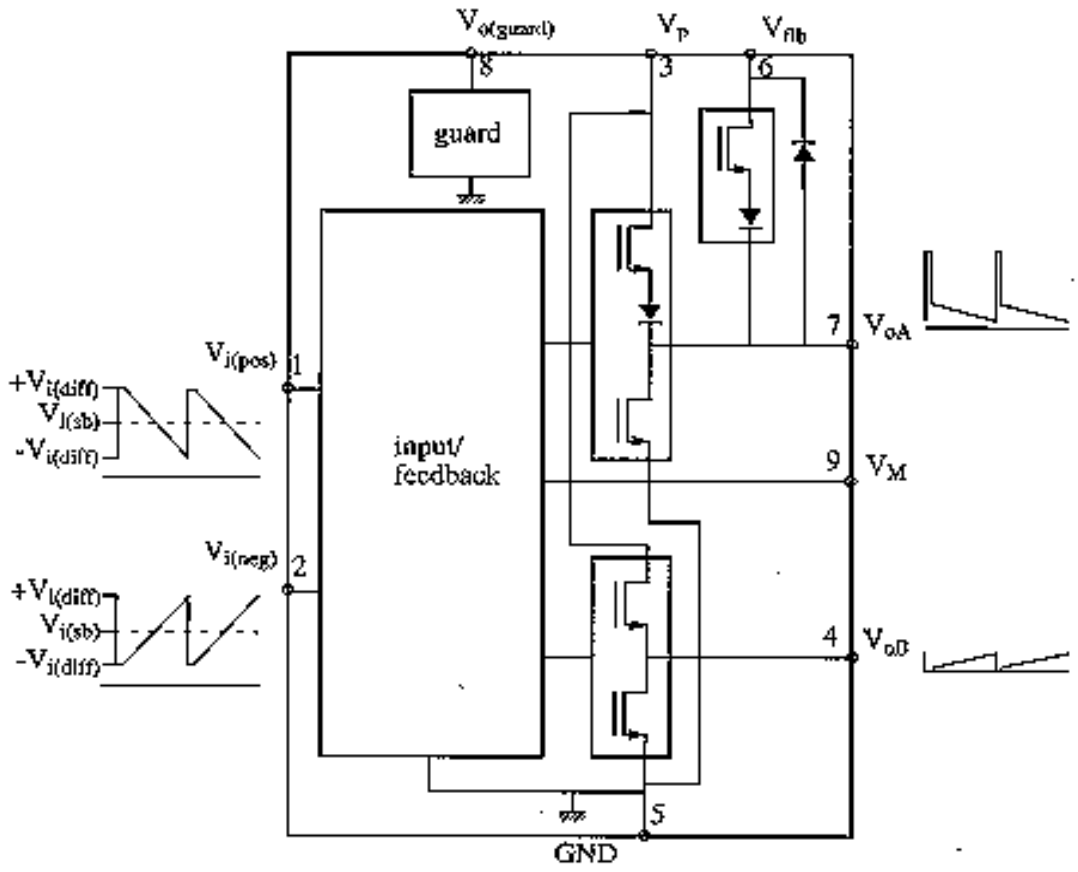
The TDA835xJ are power circuit for use in 90° and 110° colour deflection systems for field frequencies of 25 to 200Hz and 16/9 picture tubes. The circuit provides a DC driven vertical deflection output circuit, operating as a highly efficient class G system. Due to the full bridge output circuit the deflection coils can be DC coupled.
The IC is constructed in a Low Voltage DMOS process that combines Bipolar, CMOS and DMOS devices. MOS transistors are used in the output stage because of the absence of second breakdown.

4-4-1 TDA8357J

Features :
- Few external components
- Highly efficient fully DC-coupled vertical output bridge circuit
- Short rise and fall time of the vertical flyback switch
- Guard circuit
- Temperature (thermal) protection
- High EMC because of common mode inputs

Pinning

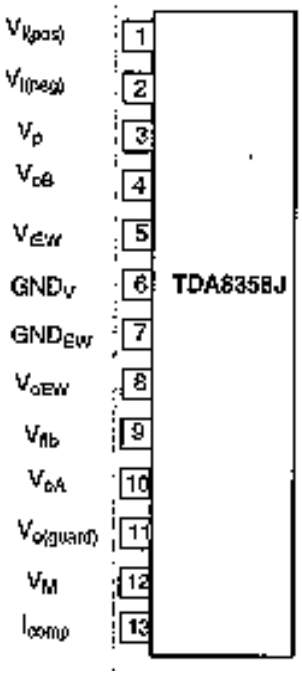
Pin	Symbol	Description
1	Vi(pos)	input voltage (positive)
2	Vi(neg)	input voltage (negative)
3	Vp	supply voltage
4	V_{OB}	output voltage B
5	GND	ground
6	Vflb	flyback supply voltage
7	V_{OA}	output voltage A
8	$V_{O(guard)}$	guard output voltage
9	V_M	input measuring resistor

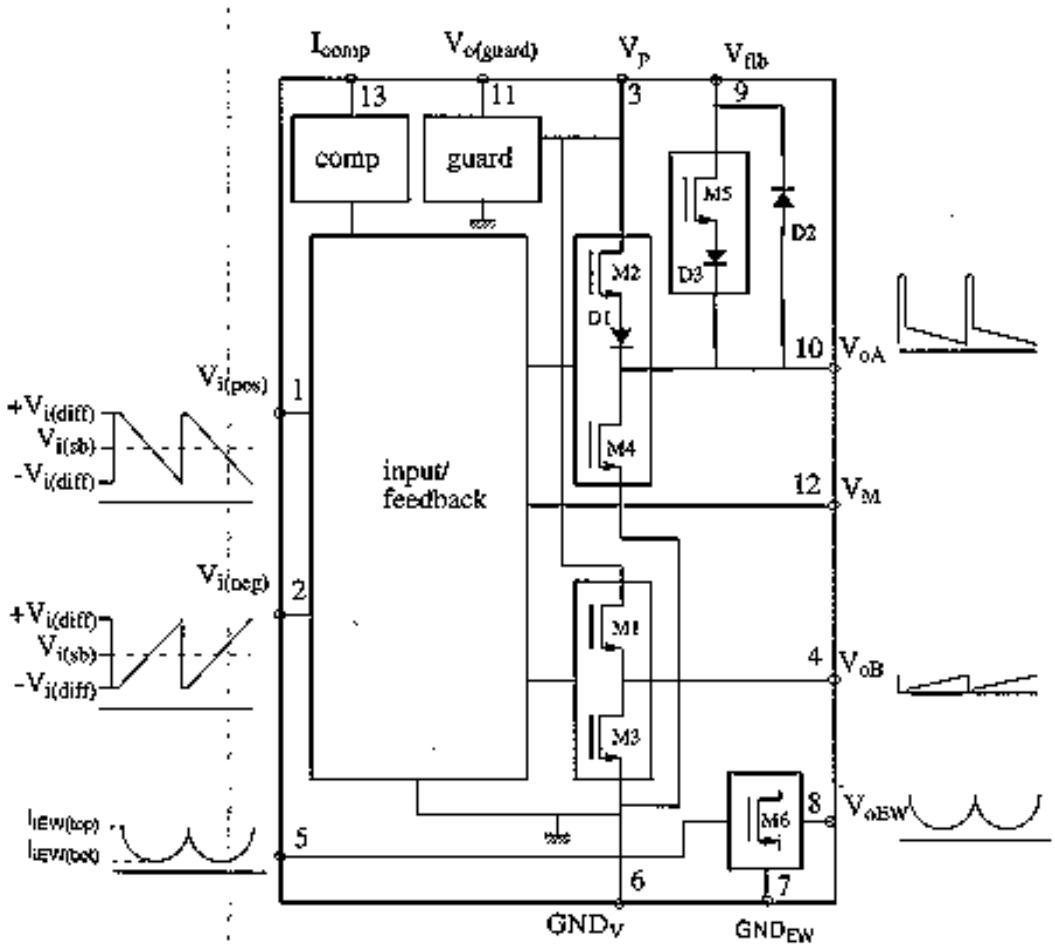


4-4-1 TDA8358J

An East-West output stage is provided that is able to sink current from the diode modulator circuit.

Features :
- Few external components
- Highly efficient fully DC-coupled vertical output bridge circuit
- Short rise and fall time of the vertical flyback switch
- Guard circuit
- Temperature (thermal) protection
- High EMC because of common mode inputs
- East-West output stage





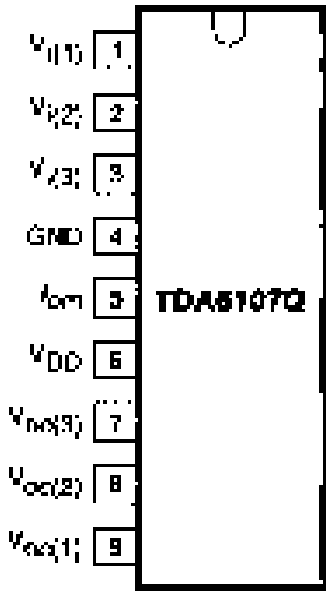
4-5 TDA6107Q

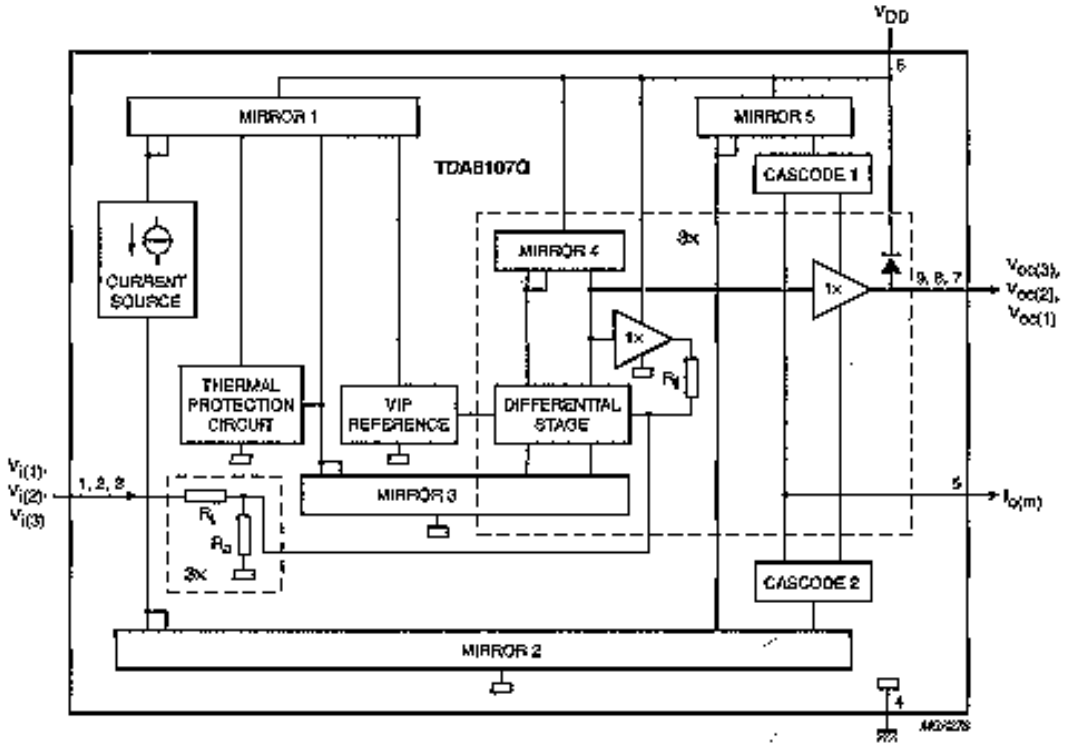
The TDA6107Q includes three video output amplifiers in one plastic DIL-Bent-SIL 9-pin medium power package, using high voltage DMOS technology, and is intended to drive the three cathodes of a colour CRT directly. To obtain maximum performance, the amplifier should be used with black-current control.

Features
- Typical bandwidth of 5.5 MHz for an output signal of 60 Vpp
- High slew rate of 900V/μs
- No external components required
- Very simple application
- Single supply voltage of 200V
- Internal reference voltage of 2.5 V
- Fixed gain of 50.
- Black-current stabilisation (BCS) circuit
- Thermal protection

Pin description

Pin	Symbol	Description
1	$V_{i(1)}$	inverting input 1
2	$V_{i(2)}$	inverting input 2
3	$V_{i(3)}$	inverting input 3
4	GND	ground (fin)
5	I_{om}	black current measurement output
6	V_{DD}	supply voltage
7	$V_{OC(3)}$	cathode output 3
8	$V_{OC(2)}$	cathode output 2
9	$V_{OC(1)}$	cathode output 1





Block diagram TDA6107Q

4-6 24C08 8 Kbit EEPROM
features :
- 8 Kbit serial I2C bus EEPROM
- Single supply voltage : 4.5 V to 5.5 V
- 1 Million Erase/Write cycles (minimum)
- 40 year data retention (minimum)

Pin description

Pin No.	Name	Description
1, 2, 3	E0, E1, E2	Device address
5	SDA	Serial Data/Address Input/Output
6	SCL	Serial clock
7	WC	Write control
8	Vcc	Supply voltage
4	Vss	Ground

The memory device is compatible with the I2C memory standard. This is a two wire serial interface that uses a bi-directional data bus and serial clock. The memory carries a built-in 4-bit unique device type identifier code (1010) in accordance with the I2C bus definition.

Serial Clock (SCL)
The SCL input is used to strobe all data in and out of the memory.
Serial Data (SDA)
The SDA pin is bi-directional, and is used to transfer data in or out of the memory

4-7 STR - F6653

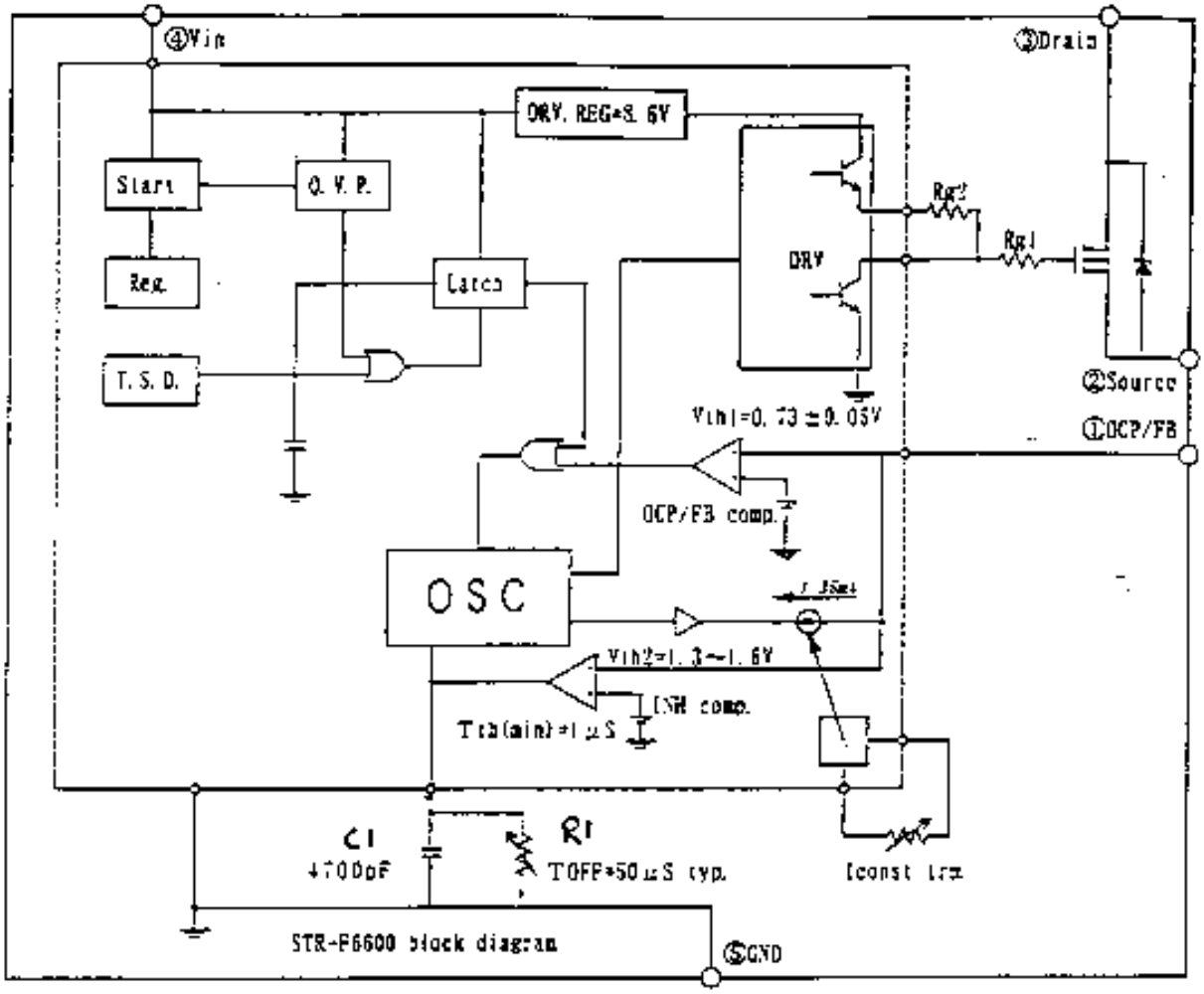
4-7-1 General description

The STR-F6653 is an hybrid IC with a build-in MOSFET and control IC, designed for flyback converter type switch mode power supply applications.

4-7-2 Features

- Small SIP fully isolated molded 5 pins package
- Many protection functions :
  - * Pulse-by-pulse overcurrent protection (OCP)
  - * Overvoltage protection with latch mode (OVP)
  - * Thermal protection with latch mode (TSD)

4-7-3 Block diagram



4-7-4 Pins description

pin	name	symbol	description
1	Overcurrent / feedback	O.C.P./ F.B.	Input of overcurrent detection signal and feedback signal
2	Source	S	MOSFET source
3	Drain	D	MOSFET drain
4	Supply	V_{IN}	Input of power supply for control circuit
5	Ground	GND	Ground

4-7-5 Control part electrical characteristics

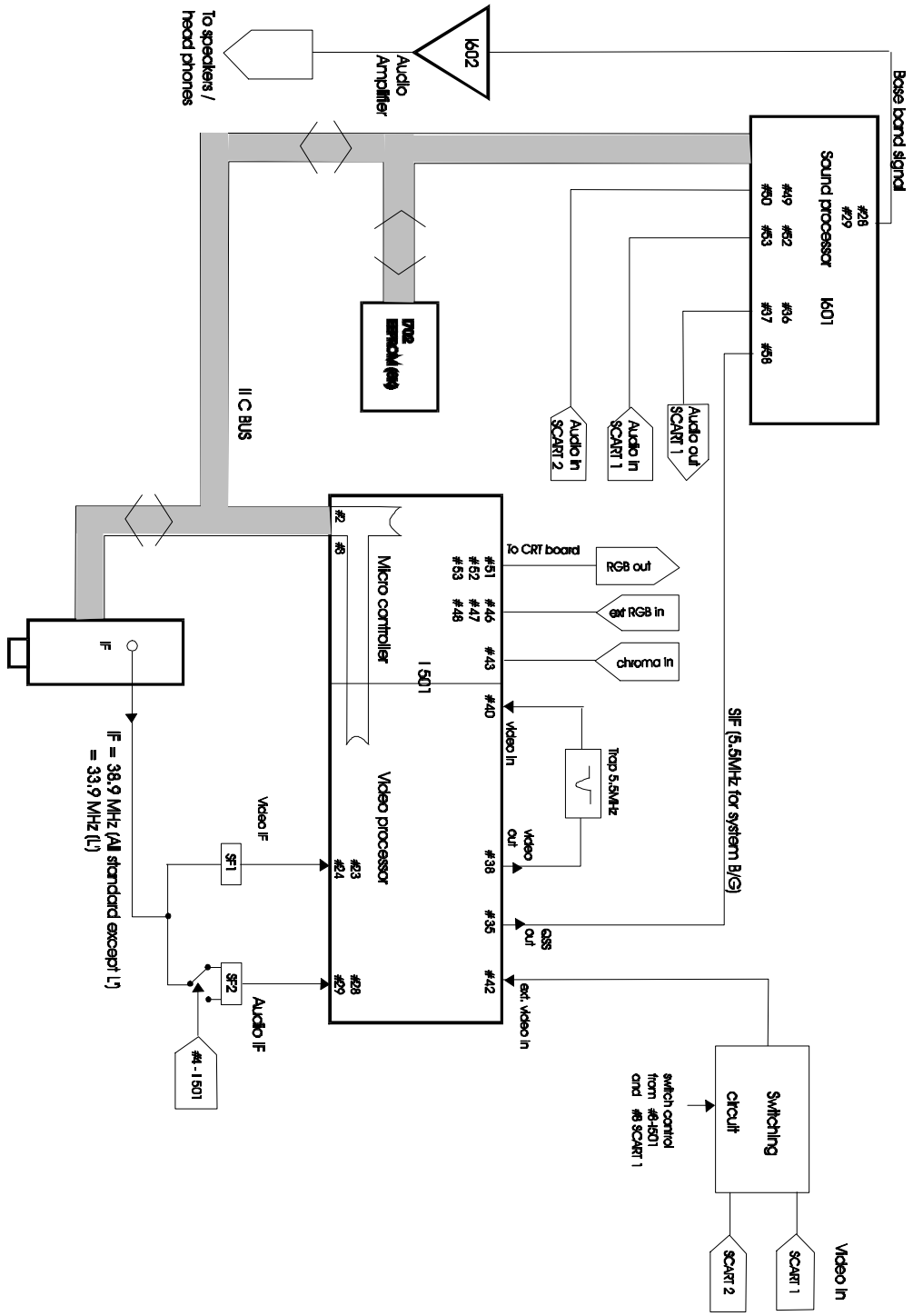
description	IC pins number	symbol	rating			unit
			min.	typ.	max.	
Operation start voltage	4-5	V_{IN} (on)	14.4	16	17.6	V
Operation stop voltage	4-5	V_{IN} (off)	9	10	11	V
Circuit current in operation	4-5	I_{IN} (on)	-	-	30	mA
Circuit current in non-operation	4-5	I_{IN} (off)	-	-	100	μA
Maximum OFF time	-	T_{OFF} (max)	45	-	55	μsec
Minimum time for input of quaxi resonant signals	1-5	T_{TH} (2)	-	-	1.0	μsec
Minimum off time	-	T_{OFF} (min)	-	-	1.5	μsec
O.C.P./F.B. terminal threshold voltage 1	1-5	V_{TH} (1)	0.68	0.73	0.78	V
O.C.P./F.B. terminal threshold voltage 2	1-5	V_{TH} (2)	1.3	1.45	1.6	V
O.C.P./F.B. terminal extraction current	1-2	$I_{OCP/FB}$	1.2	1.35	1.5	mA
O.V.P. operation voltage	4-5	V_{IN} (OVP)	20.5	22.5	24.5	V
Latch circuit sustaining voltage	4-5	I_{IN} (H)	-	-	400	μA
Latch circuit release voltage	4-5	V_{IN} (La.off)	6.6	-	8.4	V
Thermal shutdown operating temperature	-	T_J (TSD)	140	-	-	^{0}C

4-7-6 MOSFET electrical characteristics

description	IC pins number	symbol	rating			unit
			min.	typ.	max.	
Drain-to-source breakdown voltage	3-2	V_{DSS}	650	-	-	V
Drain leakage current	3-2	I_{DSS}	-	-	300	μA
On-resistance	3-2	R_{DS} (on)	-	-	1.95	Ω
Switching time	3-2	tf	-	-	250	nsec
Thermal resistance	-	θ_{CH-F}	-	-	1.25	^{0}C/W

5 - Circuit description

5-1 Block diagram



FUNCTIONAL DESCRIPTION OF VIDEO PROCESSOR Vision IF amplifier

The vision IF amplifier can demodulate signals with positive and negative modulation. The PLL demodulator is completely alignment-free.

The VCO of the PLL circuit is internal and the frequency is fixed to the required value by using the clock frequency of the μ-Controller/Teletext decoder as a reference. The setting of the various frequencies is made by the controlling software in subaddress 27H (38.9 MHz for all system except L' or 33.9 MHz for system L'). Because of the internal VCO the IF circuit has a high immunity to EMC interference's.

QSS Sound circuit

The sound IF amplifier is similar to the vision IF amplifier
and has an external AGC decoupling capacitor.

The single reference QSS mixer is realised by a multiplier. In this multiplier the SIF signal is converted to the intercarrier frequency by mixing it with the regenerated picture carrier from the VCO. The mixer output signal is supplied to the output via a high-pass filter for attenuation of the residual video signals. With this system a high performance hi-fi stereo sound processing can be achieved.

Video switches

The video switch has one input for an external CVBS or Y/C signal. The selected CVBS signal can be supplied to pin 38, the IF video output. The selection between both signals is realised by the controlling software in subaddress 22H.

The video ident circuit is connected to the selected signal. This ident circuit is independent of the synchronisation.

Synchronisation circuit

The IC contains separator circuits for the horizontal and vertical sync pulses and a data-slicing circuit which extracts the digital teletext data from the analogue signal.

The horizontal drive signal is obtained from an internal VCO which is running at a frequency of 25 MHz. This oscillator is stabilised to this frequency by using a 12 MHz signal coming from the reference oscillator of the μ-Controller/Teletext decoder.

The horizontal drive is switched on and off via the soft start/stop procedure. This function is realised by means of variation of the TON of the horizontal drive pulses.

The vertical synchronisation is realised by means of a divider circuit. The vertical ramp generator needs an external resistor and capacitor. For the vertical drive a differential output current is available. The outputs are DC coupled to the vertical output stage.

In the type TDA9367, intended for 90° picture tubes the following geometry parameters can be adjusted:
- Horizontal shift
- Vertical amplitude
- Vertical slope
- S-correction
- Vertical shift

The types which are intended to be used in combination with 110° picture tubes have an East-West control circuit. The additional controls for these types are:
- EW width
- EW parabola width
- EW upper and lower corner parabola correction
- EW trapezium correction
- Vertical zoom, horizontal parallelogram and bow correction.

Chroma and luminance processing

The chroma band-pass and trap circuits (including the SECAM cloche filter) are realised by means of gyrators and are tuned to the right frequency by comparing the tuning frequency with the reference frequency of the colour decoder. The luminance delay line and the delay cells for the peaking circuit are also realised with gyrators. The circuit contains a black stretcher function which corrects the black level for incoming signals which have a difference between the black level and the blanking level.

Colour decoder

The ICs can decode PAL, NTSC and SECAM signals. The PAL/NTSC decoder does not need external reference crystals but has an internal clock generator which is stabilised to the required frequency by using the 12 MHz clock signal from the reference oscillator of the µ-Controller/Teletext decoder.

The Automatic Colour Limiting (ACL) circuit (switchable via the ACL bit in subaddress 2OH) prevents oversaturation occurring when signals with a high chroma-to-burst ratio are received. The ACL circuit is designed such that it only reduces the chroma signal and not the burst signal. This has the advantage that the colour sensitivity is not affected by this function.

SOFTWARE CONTROL

The CPU communicates with the peripheral functions using Special function Registers (SFRS) which are addressed as RAM locations. The registers for the Teletext decoder appear as normal SFRs in the µ-Controller memory map and are written to these functions by using a serial bus. This bus is controlled by dedicated hardware which uses a simple handshake system for software synchronisation.

For compatibility reasons and possible re-use of software blocks, the TV processor is controlled by I2C bus. The TV processor control registers cannot be read. Only the status registers can be read (Read address 8A).

The SECAM decoder contains an auto-calibrating PLL demodulator which has two references, via the divided 12 MHz reference frequency (obtained from the µ-Controller) which is used to tune the PLL to

the desired free-running frequency and the bandgap reference to obtain the correct absolute value of the output signal. The VCO of the PLL is calibrated during each vertical blanking period, when the IC is in search or SECAM mode.

The base-band delay line (TDA 4665 function) is integrated. This delay line is also active during NTSC to obtain a good suppression of cross colour effects. The demodulated colour difference signals are internally supplied to the delay line.

RGB output circuit and black-current stabilisation

In the RGB control circuit the signal is controlled on contrast, brightness and saturation. The ICs have a linear input for external RGB signals. The signals for OSD and text are internally supplied to the control circuit. The output signal has an amplitude of about 2 Volts black-to-white at nominal input signals and nominal settings of the various controls.

To obtain an accurate biasing of the picture tube the 'Continuous Cathode Calibration' system has been included in these ICs. A black level off set can be made with respect to the level which is generated by the black current stabilisation system. In this way different colour temperatures can be obtained for the bright and the dark part of the picture.
The black current stabilisation system checks the output level of the 3 channels and indicates whether the black level of the highest output is in a certain window or below or above this window. This indication is read from the status byte 01 and is used for automatic adjustment of the Vg2 voltage during the production of the TV receiver.

During switch-off of the TV receiver a fixed beam current is generated by the black current control circuit. This current ensures that the picture tube capacitance is discharged. During the switch-off period the vertical deflection is placed in an overscan position so that the discharge is not visible on the screen.

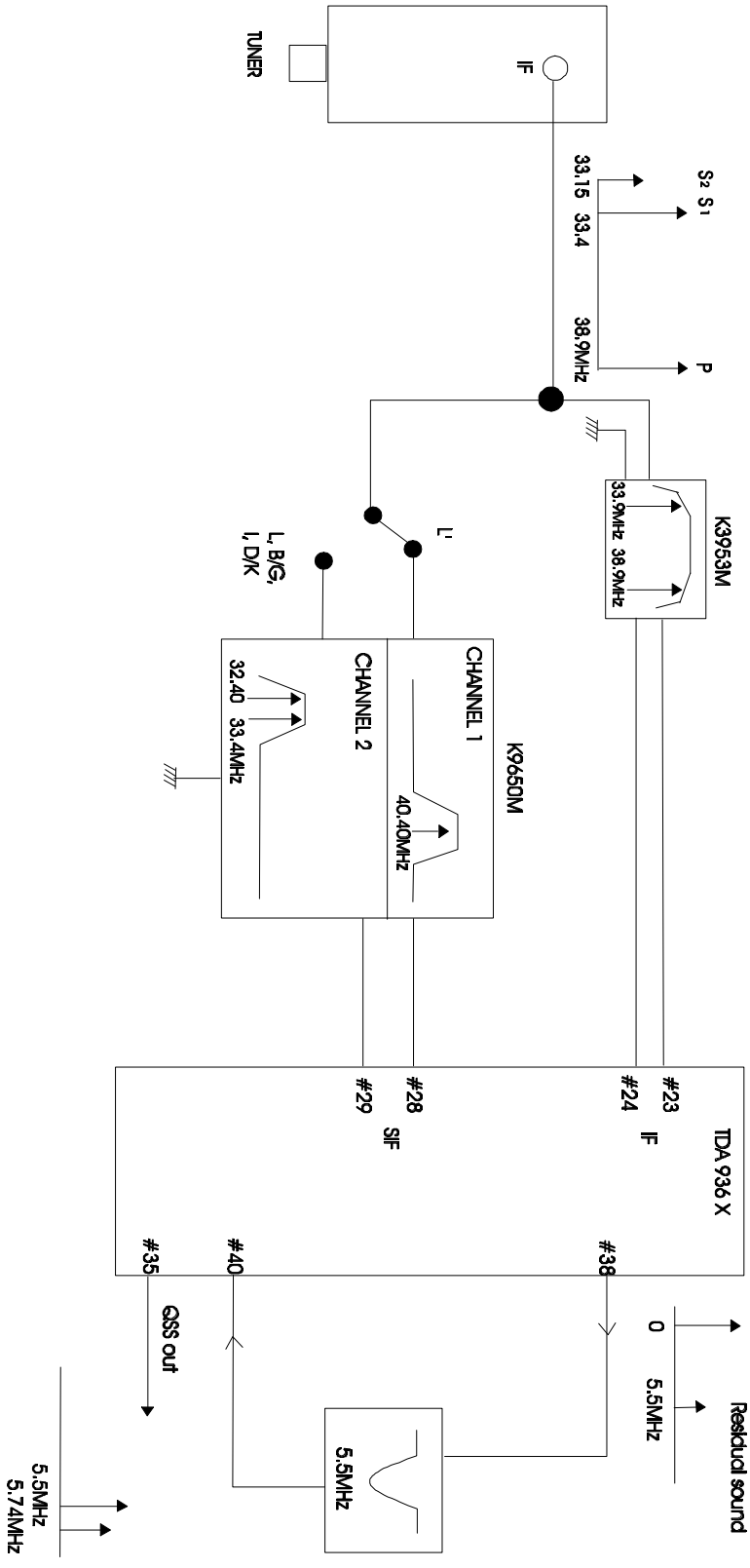
5-2 IF

The TDA936x has an alignment free IF PLL demodulator. The fully integrated oscillator is automatically calibrated, using the 12 MHz crystal as a frequency reference. The IF frequency is simply set in TV-Processor by I2C bus.
The AFC information is available via I2C bus from the TV-Processor status bytes. The controlling software uses this information for tuner frequency tracking (automatic following). The AFC windows is typically 125Khz wide. The minimum frequency step of the tuner is 62.5 kHz.
This AFC function is disabled when a program is tuned using the direct frequency entry or after fine tuning adjustment. Therefore it is recommended to tune channel with the TV search function (manual or ATSS) or using the direct channel entry to enable the Automatic Frequency Control.

SAW filters

Ref.	Standard	Features
K3953M	B/G - D/K - I - L/L'	- IF filter for video application - TV IF filter with Nyquist slopes at 33.9 MHz and 38.9 MHz - Constant group delay
K9650M	B/G - D/K - I - L/L'	- IF filter for audio application - TV IF audio filter with two channels - Channel 1 (L') with one pass band for sound carrier at 40.40 MHz - Channel 2 (L, D/K, I, B/G) with one pass band for sound carriers between 32.40 MHz and 33.40 MHz

For SECAM L and L' the TDA936x is switched to positive modulation via I2C bus. SECAM L' only occur in VHF band I and have their picture and sound carrier interchanged, compared to SECAM L and PAL B/G channels. For SECAM L' the picture carrier is situated at 33.9 MHz and the AM sound carrier at 40.40 MHz. The IF PLL reference is tuned from 38.9 to 33.9 MHz, this is done via I2C Bus and the SIF filter is switched from channel 2 to channel 1 ; this is done by pin 4 of TDA 936x. The tuner AGC time constant is slower than for negative modulation, because the TDA936x reduces its AGC current. To even slower the AGC time constant an extra series resistor R103 is added. To prevent IF overload when jumping from a very strong transmitter to a weak transmitter a diode D101 has been added
The SAW filter (SF1) has a double Nyquist slope at 38.9 MHz and 33.9 MHz needed for this multistandard application. The disadvantage of this choice is that a 5.5 MHz trap filter (Z501) is needed to suppress the residual sound carrier in the video for B/G signals.



Chassis block diagram : IF

5-3 Source switching

The TDA936x has only one external video input, the external video switching circuit made with Q504, Q505, Q507, Q508 and Q509 allows 2 external video signal inputs. The switching command can be either the SCART1 slow switching pin 8 or the µ-Controller pin 8 when the software takes control of the video source. The µ-Controller pin 8 is automatically configured by the controlling software (See table below). This pin is also capable of detecting the 3 Status (0, 1A, 1B) described in SCART specifications for automatic format switching.

TV mode	µ-Controller pin 8 Status	Level
RF auto	Input - High Impedance	< 1V
RF Forced	Input - High Impedance	not defined
AV 1 Auto 4:3	Input - High Impedance	> 2.7 V
AV 1 Auto 16:9	Input - High Impedance	1 V < x < 2.7 V
AV 1 forced	Output - Push Pull	Max. 3.3V
AV 2	Output - Push Pull	< 0.2 V
SVHS	Output - Push Pull	< 0.2 V

The controlling software via I2C bus selects the signal source :
- Video signal from tuner (Pin 40).
- External video (SCART 1 or 2) depending on Q508 base level.
- External SVHS from SCART 2.

The sound source switching is done in the MSP3415D (I601), by the µ-Controller via I2C bus.

Fast R, G, B insertion : The external R, G, B insertion needs a fast switching and cannot be controlled by the software (instruction cycle of 1µ sec). The fast switching pin 16 of SCART 1 is directly connected to the TV processor pin 45 (Fast blanking input). The display is synchronised with the selected video source, i.e. to get stable R, G, B inserted signal they must be synchronised with the selected video source. The controlling software only enable or disable (AV2, SVHS, or Forced RF source selected) fast blanking.

5-4 µ-Controller I/O pin configuration and function

The I/O pins of the µ-Controller can be configured in many way. All port functions can be individually programmed by use of the SFR registers.
Each I/O port pin can be individually programmed in these configurations :

Open drain
In this mode, the port can function as in and output. It requires an external pull-up resistor. The maximum allowable supply voltage for this pull up resistor is +5V.
So in this mode it is possible to interface a 5 Volt environment like I2C while the µ-Controller has a 3.3 Volt supply.

Push-Pull
The push pull mode can be used for output only. Both sinking and sourcing is active, which leads to sleep slopes. The levels are 0 and Vddp, the supply voltage 3.3Volts.

High impedance

This mode can be used for input only operation of the port.

Special port for LED
Pin 10 and 11 have the same functionality as the general I/O pins but in addition, their current source and sink capacity is 8 mA instead of 4 mA. These pins are used for driving LED's via a series current limiting resistor.

μ-Controller I/O pin configuration and function table

pin	name	configuration		description
		Stand by	TV ON	
1	n.u.	High impedance	High impedance	not used
2	SCL	Open Drain	Open Drain	Serial clock line
3	SDA	Open Drain	Open Drain	Serial data line
4	SECAM L'	High impedance	Push Pull	SIF filter switching
5	OCP	High impedance	High impedance	Over Current Protection (Switch the set OFF if the voltage on this pin is <2.7V)
6	-	High impedance	High impedance	For factory use only
7	Key in	High impedance	High impedance	Local keyboard input
8	S/SW	High impedance	See table above	external video switch
10	Red LED	High impedance	Open Drain	
11	Green LED	Open Drain	High impedance	
62	Audio mute	Push Pull	Push Pull	High in stand by mode

5-5 Sound processing

Analogue sound IF - input section
The input pins ANA_IN1+ and ANA_IN- offer the possibility to connect sound IF sources to the MSP 3415D. The analogue-to-digital conversion of the pre-selected sound IF signal is done by an A/D converter, whose output is used to control an analogue automatic gain circuit (AGC), providing an optimal level for a wide range of input levels.

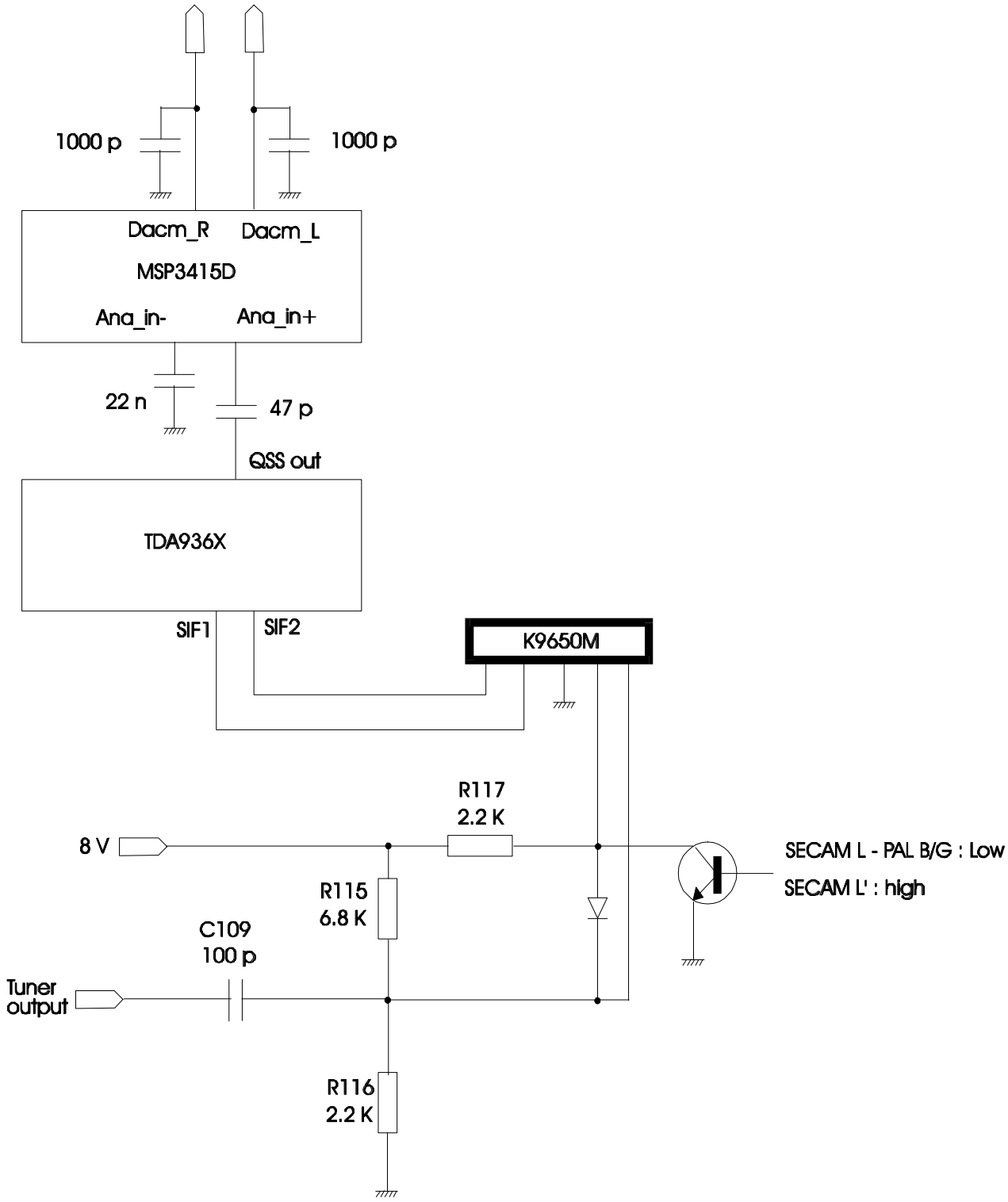
Quadrature Mixers
The digital input coming from the integrated A/D converter may contain audio information at a frequency range of theoretically 0 to 9 MHz corresponding to the selected standards. By means of two programmable quadrature mixers, two different audio sources ; for example, NICAM and FM-mono, may be shifted into baseband position.

Phase and AM discrimination
The filtered sound IF signals are demodulated by means of the phase and amplitude discriminator block. On the output, the phase and amplitude is available for further processing. AM signals are derived from the amplitude information, whereas the phase information serves for FM and NICAM demodulation.

NICAM decoder
In case of NICAM - mode, the phase samples are decoded according the DQPSK - coding scheme. The output of this block contains the original NICAM bitstream.

DSP section
All audio baseband functions are performed by digital signal processing (DSP). The DSP section controls the source and output selection, and the signals processing.

Sound Mode switching
In case of NICAM transmission, the controlling software read the bit error rate and the operation mode from the NICAM Decoder. When the set is in “Auto detection” mode (default mode after ATSS) the controlling software set automatically the sound mode (NICAM mono, NICAM Dual 1 or NICAM Dual 2) depending on the transmitted mode.
In case of 2 Carrier FM transmission, the controlling software read the transmission mode and the signal quality level from the Stereo Detection Register. When the set is in “Auto detection” mode the controlling software set automatically the sound mode (mono, Stereo, Dual 1, Dual 2) depending on the transmitted mode.
In “Auto detection” mode the controlling software evaluate the signal quality and automatically switch to the analogy sound carrier 1, if the transmission quality is too poor. To avoid unwanted automatic switching the threshold levels mono to stereo and stereo to mono is different.
In “forced mono “ mode (Red OSD in recall section), the controlling software configure the MSP3415D to demodulate only the analogue (FM or AM) sound carrier 1, no matter the signal quality.
The sound mode “ forced “ or “ Autodetect” is stored for each programme.



Sound signal flow diagram

5-6 Sound amplification

The TDA8944J (TDA8946J) is a stereo BTL audio amplifier capable of delivering 2 x 7 W (2 x 15 W) output power to an 8 Ω load at THD = 10%, using a 12 V power supply and an external heatsink. The voltage gain is fixed at 32dB.

With the three-level MODE input the device can be switched from 'standby' to 'mute' and to 'operating' mode.
The TDA 8944J outputs are protected by an internal thermal shutdown protection mechanism and short-circuit protection.

Power amplifier

The power amplifier is a Bridge Tied Load (BTL) amplifier with an all-NPN output stage, capable of delivering a peak output current of 1.5 A.
The BTL principle offers the following advantages :
- Lower peak value of the supply current.
- The ripple frequency on the supply voltage is twice the signal frequency.
- No DC-blocking capacitor
- Good low frequency performance

Mode selection

The TDA894xJ has several functional modes, which can be selected by applying the proper DC voltage to pin MODE.

Mute : In this mode the amplifier is DC biased but not operational (no audio output). This allows the input coupling capacitors to be charged to avoid pop-noise. The devices is in mute mode when 2.5 V < V_{MODE} < (Vcc-1.5 V).

Operating : In this mode the amplifier is operating normally. The operating mode is activated at V_{MODE} < 0.5 V.

5-7 Vertical deflection

The vertical driver circuit is a bridge configuration. The deflection coil is connected between the output amplifiers, which are driven in phase opposition. The differential input circuit is voltage driven. The input circuit is especially intended for direct connection to driver circuits which deliver symmetrical current signals, but is also suitable for asymmetrical currents. The output current of these devices is converted to voltages at the input pins via resistors R350 and R351. The differential input voltage is compared with the output current through the deflection coils measured as voltage across R302, which provides internal feedback information. The voltage across R302 is proportional to the output current.
Flyback voltage
The flyback voltage is determined by an additional supply voltage V_{flb}. The principle of operation with two supply voltages (class G) makes it possible to fix the supply voltage Vp optimum for the scan voltage and the second supply voltage V_{flb} optimum for the flyback voltage. Using this method, very high efficiency is achieved. The supply voltage V_{flb} is almost totally available as flyback voltage across the coil, this being possible due to the absence of a coupling capacitor.
Protection
The output circuit has protection circuits for :
- Too high die temperature
- Overvoltage of output stage A

Guard circuit
The guard signal is not used by the TDA936x to blank the screen in case of fault condition.

Damping resistor
For HF loop stability a damping resistor (R305) is connected across the deflection coil.

EAST-WEST Amplifier (TDA8358J only)
The East-West amplifier is current driven. It can only sink currents of the diode modulator circuit. A feedback resistor R397 is connected between the input and output of this inverting amplifier in order to convert the East-West correction input into an output voltage.

5-8 Power supply (STR-F6653)

5-8 -1 STR-F6653 general description

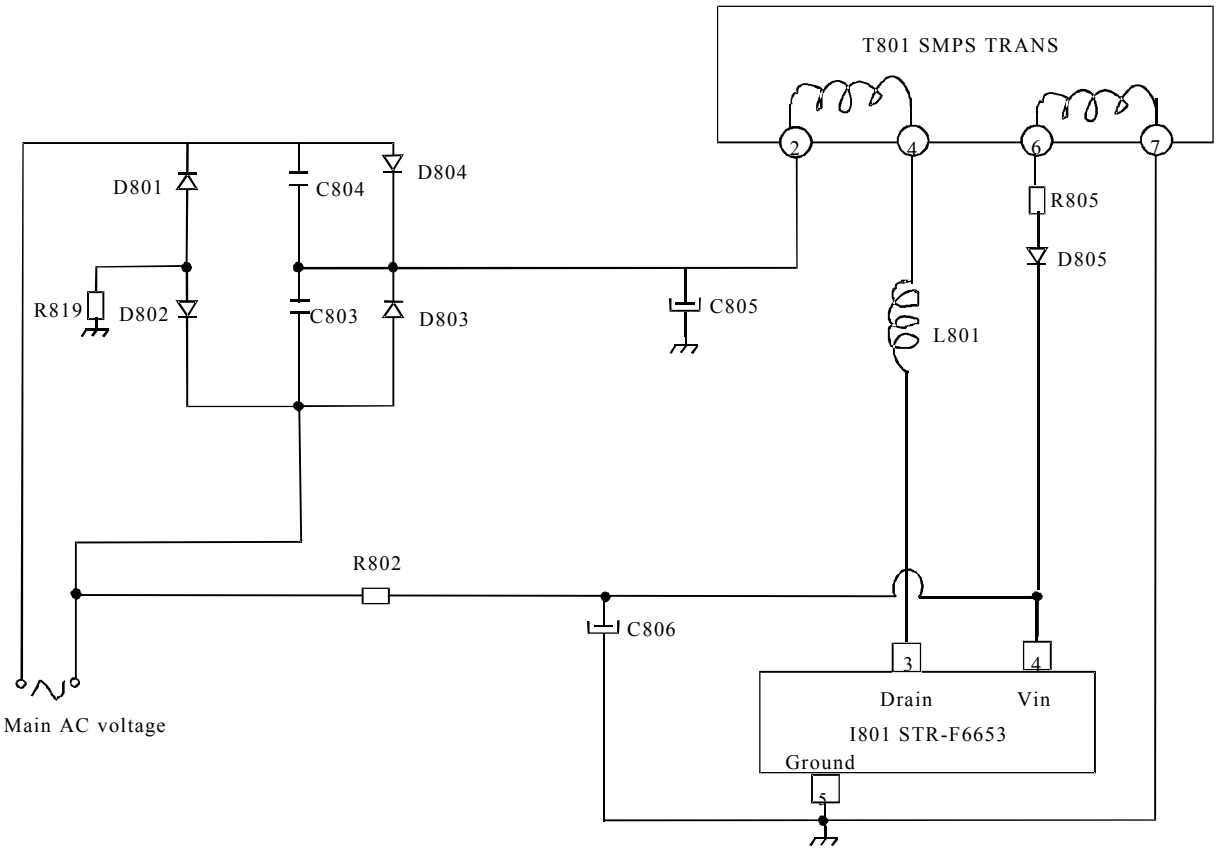
The STR-F6653 is an hybrid IC with a build-in MOSFET and control IC, designed for flyback converter type switch mode power supply applications.

5-8 -2 Power supply primary part operations

An oscillator generates pulses signals which turn on and off a MOSFET transistor.

* Start -up circuit: V_{IN}

The start-up circuit is used to start and stop the operation of the control IC, by detecting a voltage appearing at V_{IN} pin (pin 4).



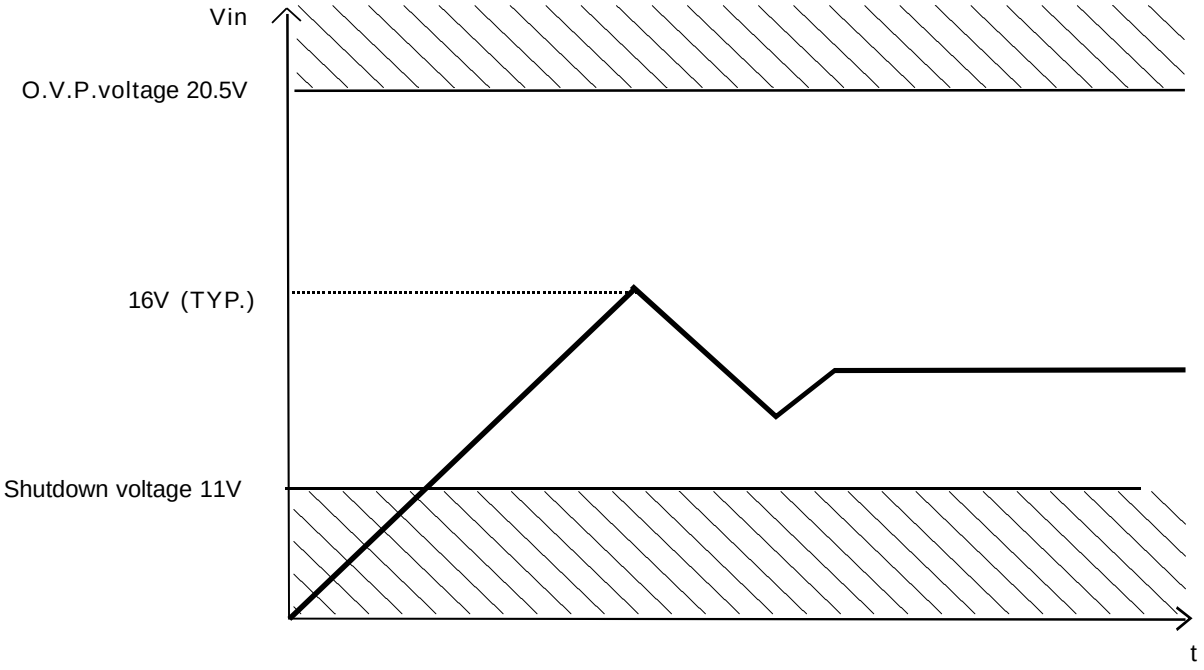
Power supply start-up circuit

When the power switch is pushed on, V_{IN} increases slowly. During this time, C806 is charged through R802.

As soon as V_{IN} reaches 16V, the STR-F6653 control circuit starts operating. Then, V_{IN} is obtained by smoothing the winding voltage which appears between pin6 and pin7 of the SMPS transformer.

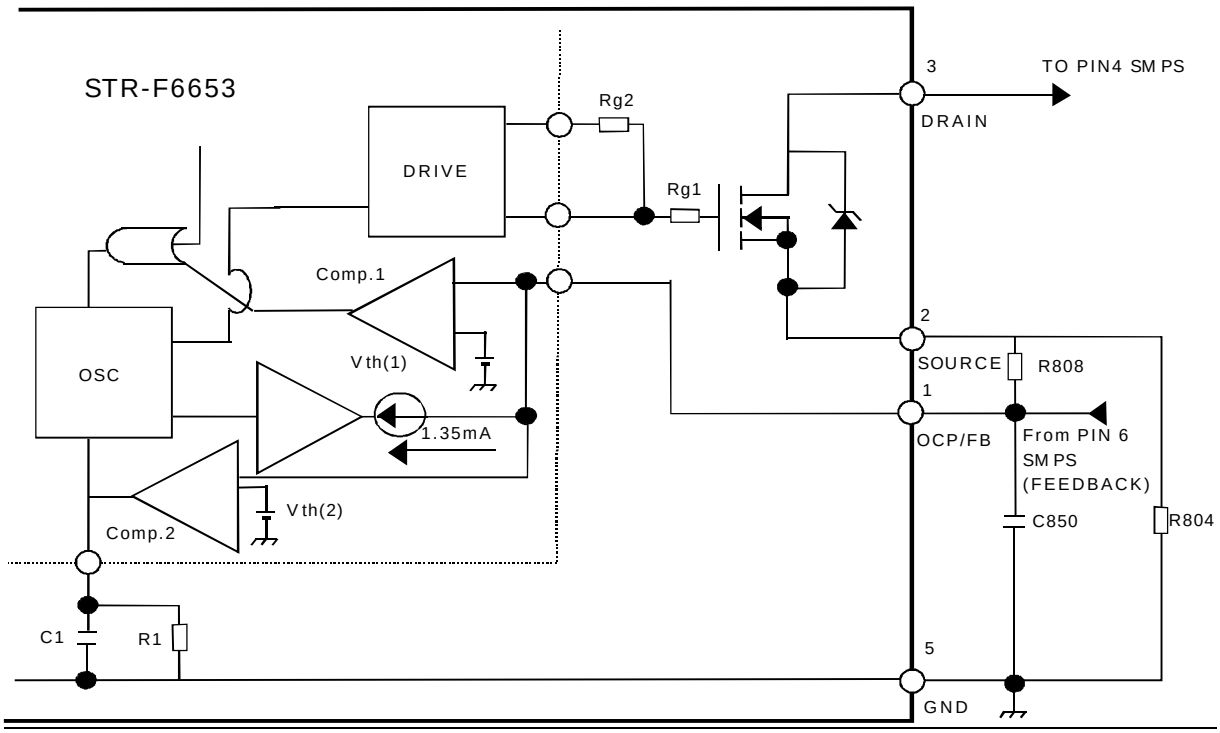
As this winding voltage does not increase to the set voltage immediately after the control circuit starts operating, V_{IN} starts dropping. However, as this winding voltage reaches the set value before V_{IN} voltage drops to the shutdown voltage (at 11V), the control circuit continues operating (see below V_{IN} voltage at start-up). R805 resistor prevents that V_{IN} pin voltage varies according to the secondary side output current.

V_{IN} must be set higher than the shutdown voltage (V_{IN} (off) = $11V_{max}$) and lower than the O.V.P. (overvoltage protection) operating voltage
(V_{OVP} = $20.5V_{min}$)

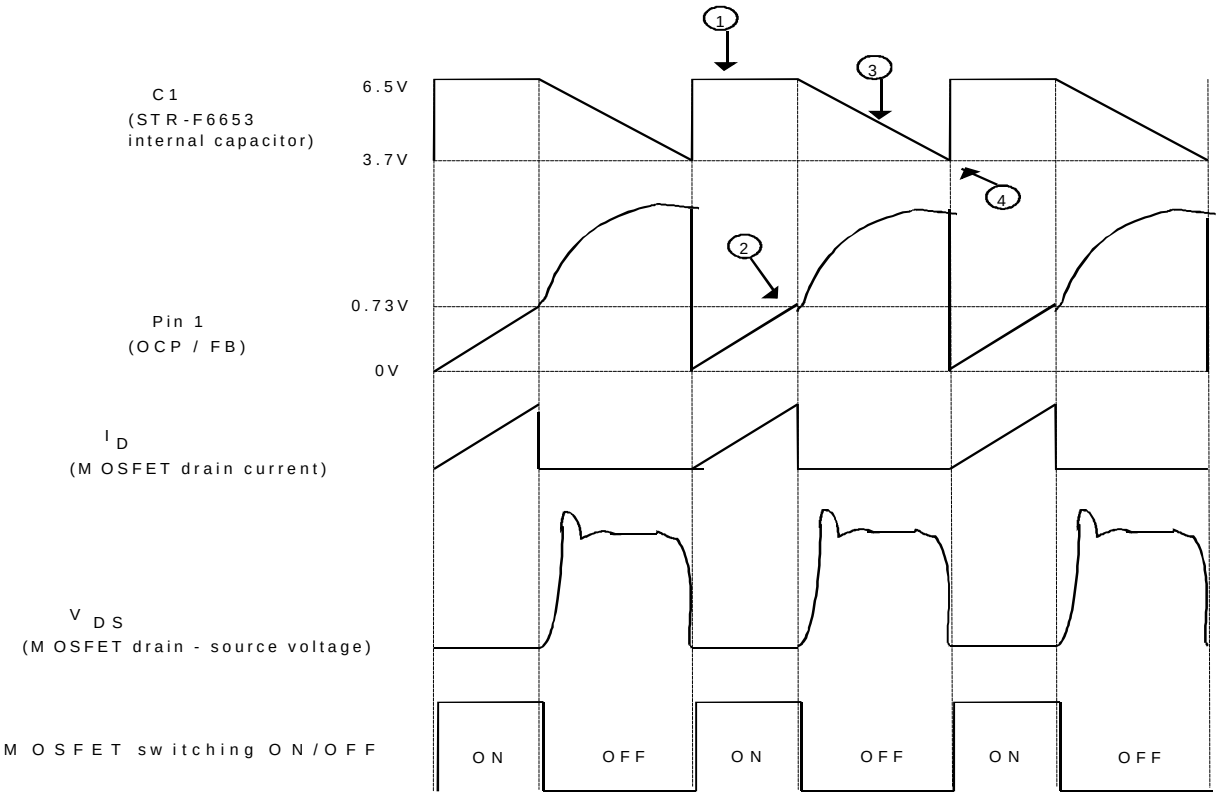


Waveform of Vin pin voltage at start-up

* STR-F6653 oscillating operation



Oscillating operation



Waveforms during oscillating operation

 When the MOSFET is ON, the STR-F6653 internal capacitor C1 is charged at the constant voltage 6.5V.
At the same time, the voltage at pin 1 (OCP / FB) increases with the same waveform as the MOSFET drain current.

 When the pin 1 voltage reaches the threshold voltage V_{TH1} = 0.73V, the STR-F6653 internal comparator 1 starts operating. The STR-F6653 internal oscillator is inverted and the MOSFET turns OFF.

 When the MOSFET turns OFF, charging of STR-F6653 internal capacitor C1 is released and C1 starts discharging by the STR-F6653 internal resistance R1. So, C1 voltage starts falling in accordance with the gradient regulated by the constant discharging time of C1 and R1. So, this means that the fixed time determined by C1 and R1 is the OFF-time of the MOSFET.

 When C1 voltage falls to around 3.7V, the STR-F6653 internal oscillator is reversed again and the MOSFET turns ON. C1 is quickly charged to around 6.5V

The MOSFET continues to oscillate by repeating the above procedure.

* STR-F6653 protection circuits

- **overcurrent protection function (OCP)**

Overcurrent protection is performed pulse by pulse detecting at STR-F6653 pin 1 (OCP) the peak of the MOSFET drain current in every pulse.

- **latch circuit**

This circuit sustains an output low from the STR-F6653 internal oscillator and stops operation of the power supply when overvoltage protection (OVP) and thermal shutdown (TSD) circuit are under operation

- **thermal shutdown circuit (TSD)**

This circuit triggers the latch circuit when the frame temperature of STR-F6653 IC exceeds 140°C

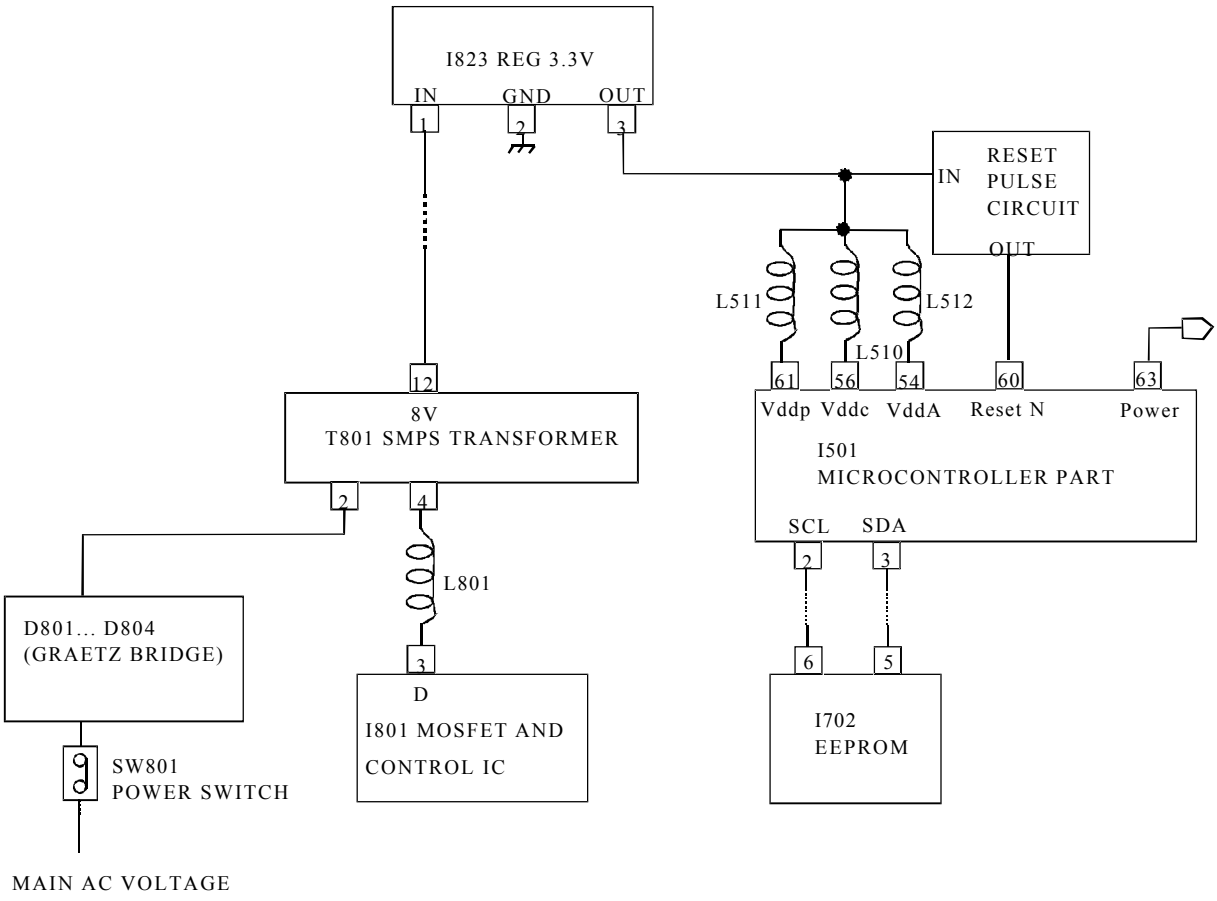
- **overvoltage protection circuit (OVP)**

This circuit triggers the latch circuit when the V_{in} voltage exceeds 22V (typ.)

5-9 TV start-up, TV normal run and stand-by mode operations

5-9-1 TV start-up operations

* Schematic diagram for start-up operations



Start-up operations

* TV start-up and microcontroller initialization

- When SW801 power switch is pushed, main AC voltage is applied to T801 transformer (after rectification by D801...D804 diodes). Then, T801 SMPS transformer starts operating and supplies DC voltage to I823 (3.3V regulator).

- This regulator provides 3.3V DC voltage to I501 microcontroller power supply pins (pins 54, 56, 61) and to the reset pulse circuit which provides reset pulse to I501 microcontroller reset pin (pin 60).

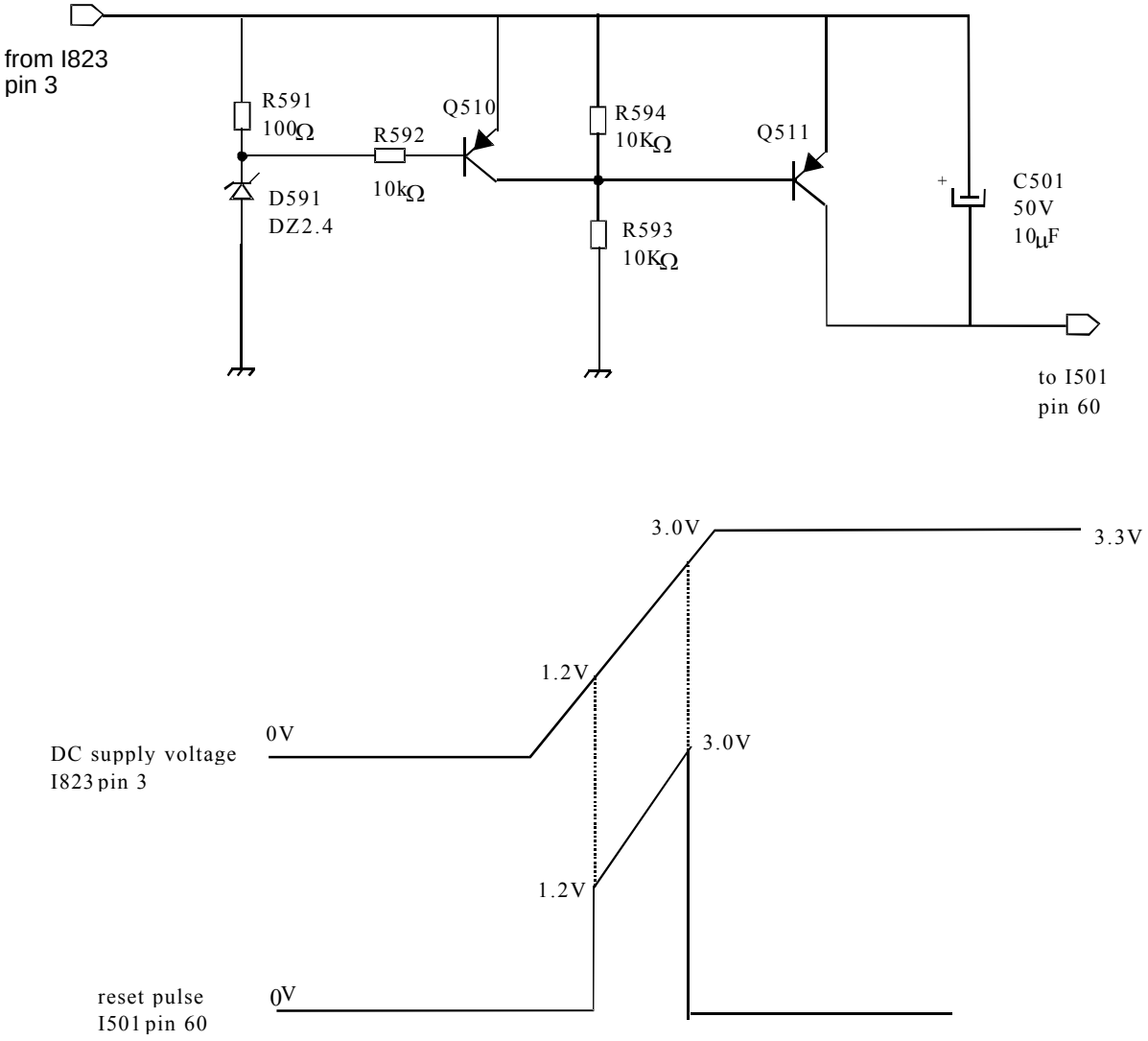
- Then, the microcontroller starts its initialization. Its power pin (pin 63) is set to high which allows delivery of power supply voltages (123V, 8V, 5V...). At this step, all IC's start working but no picture appears on screen: I501 IC doesn't provide horizontal drive voltage.

- Then, the microcontroller consults I702 EEPROM via I2C bus to know the last TV set mode (normal run mode or stand-by mode) before switching off.

. If the TV set was on normal run mode before switching off, the microcontroller delivers horizontal drive voltage at pin 33 and picture appears on screen.

. If the TV set was on stand-by mode before switching off, the microcontroller switches TV set to stand-by mode, decreasing power pin voltage (pin 63). This matter will be explained on paragraph 5-9-2-b.

* Reset pulse circuit



Reset pulse circuit and corresponding waveforms

* Reset pulse circuit operations description

- When DC supply voltage from I823 regulator starts rising (from 0V to 1.2V), no current flows through D591 zener diode. So, Q510 is in off mode.
  Also $V_{be\ Q511}$ =Vcc/2 -Vcc = -Vcc/2 > -0.6V. So, Q511 is in off mode.
  Then, no voltage reaches I501 pin 60.
- When this voltage reaches 1.2 V, Q510 stays in off mode
  but $V_{be\ Q511}$ = -0.6V. So, Q511 is switched on and starts driving DC supply voltage to I501 pin 60.
- When the DC supply voltage reaches (2.4V +0.6V) =3.0V, Q510 starts conducting but as the Q511 base-emitter voltage is the same as the collector-emitter voltage of the saturated Q510, Q511 switches off and no voltage reaches I501 pin 60.
- If the DC supply voltage decreases below 3 V, Q510 switches off immediately. Q511 starts conducting, pulling I501 pin 60 high.
  At the same time, it discharges the reset capacitor C501. Discharging this capacitor is necessary to garantee a defined reset pulse duration.

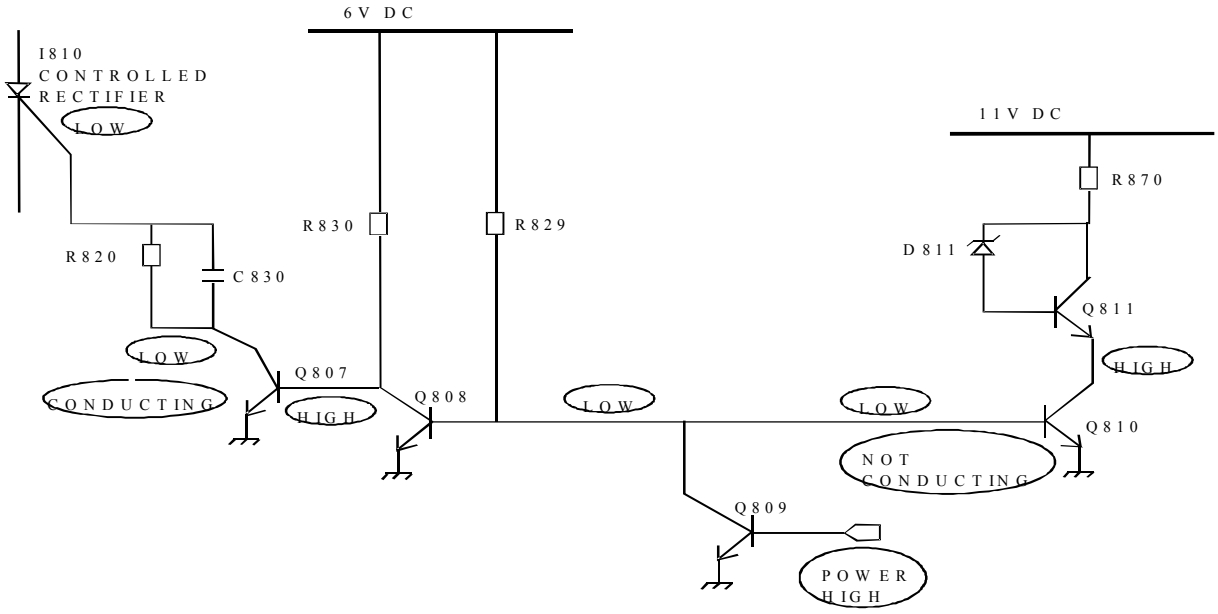
5-9-2 TV normal run and stand-by mode operations

Depending on remote control commands, I501 microcontroller part pin 63 (power) is set to:
- high for normal run mode
- low for stand-by mode

a) TV on normal run mode

* I501 microcontroller part pin 63 (power) effect

I501 microcontroller part pin 63 (power) is connected to the following circuit:



I501 microcontroller part pin 63 (POWER) effect

On normal run mode, I501 microcontroller pin 63 (power) is set to high

- So, I810 controlled rectifier is not conducting

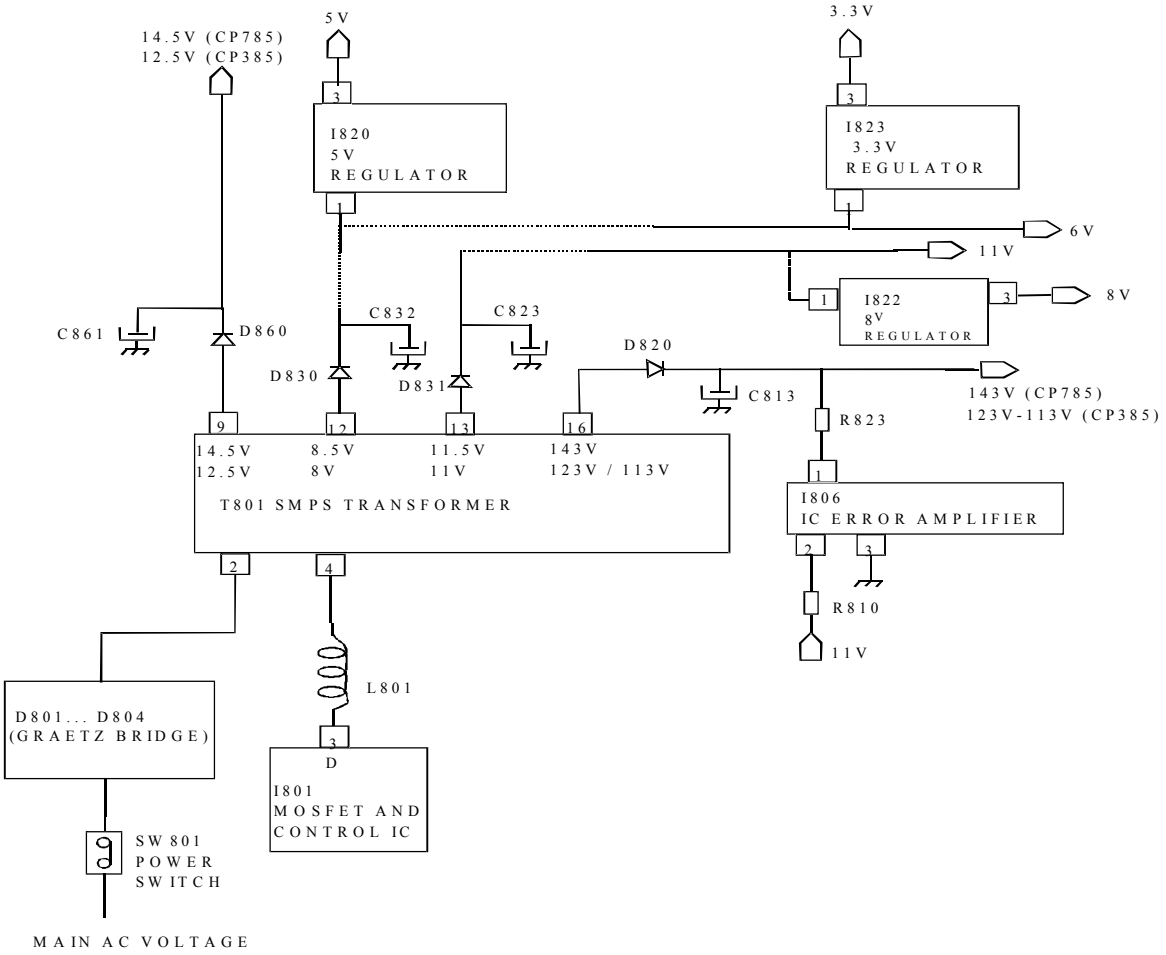
  - Q809 is conducting. So, Q808 is not conducting and Q807 is conducting
  - So, Q807 collector is connected to the ground and I810 controlled rectifier gate pin is set to low (no conducting)

- So, current from 11V DC voltage (from T801 SMPS transformer pin 13) does not flow through Q811 and Q810 transistors but flows through I806 IC error amplifier

  - Q809 is conducting. So, Q810 is not conducting and no current flows from Q810 collector to the ground

Therefore, the power supply circuit diagram is the one shown on the next paragraph

* power supply circuit diagram during TV set normal run



Power supply operation during TV set normal run

* power supply functioning during TV set normal run mode

- I801 transmits controlled pulses to T801 which generates DC voltages after rectifications by secondary part diodes and electro capacitors (by example by D820 and C813 on 143V (CP785) / 123V -113V (CP385) supply voltage line).

- 8V, 5V, 3.3V supply voltage lines have stabilized voltages obtained by I820, I822, I823 voltage regulators.

- On 143V (CP785) / 123V-113V (CP385) supply voltage line, R823 resistor has been chosen to reach exact DC voltage required on this line.

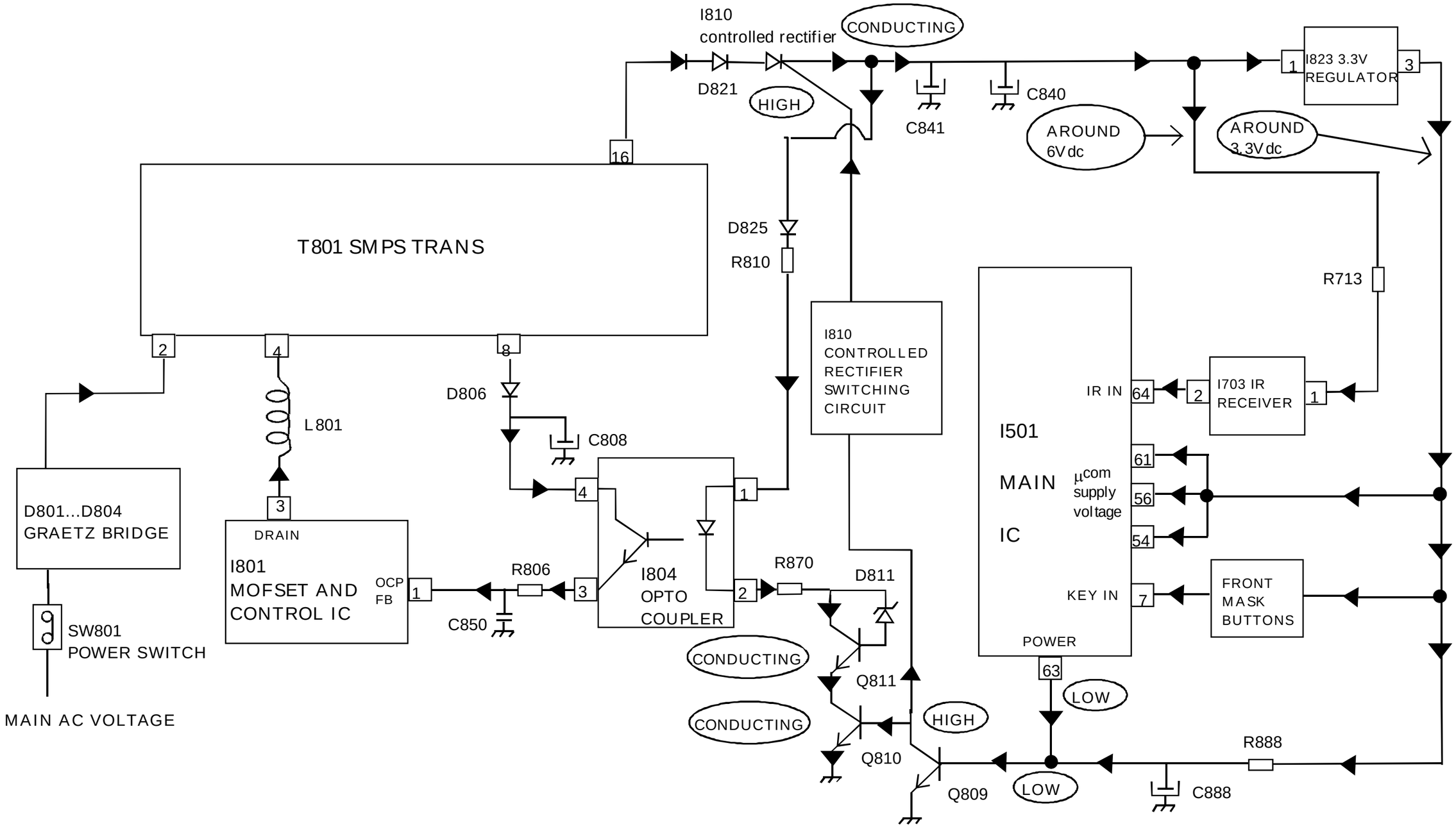
- 143V (CP785) / 123V-113V (CP385) supply voltage line includes an IC error amplifier (I806) which corrects unexpected DC voltage variations on this line.

* power supply IC delivery during TV set normal run

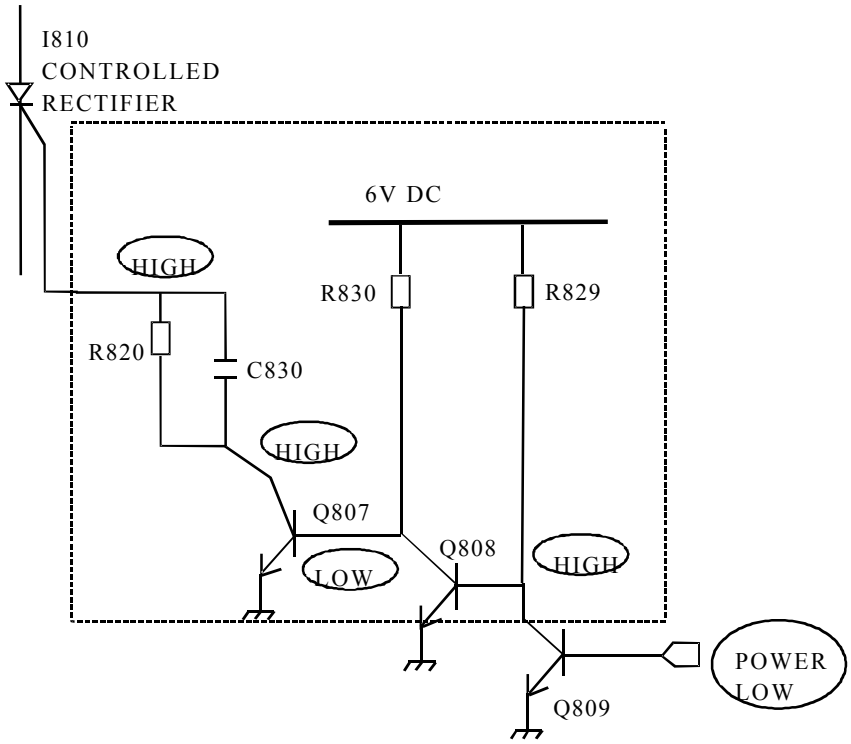
power supply line	IC power supply delivery	Remarks
143V (CP785) 123V-113V (CP385)	FBT	FBT supplies 45V to I301 vertical IC FBT supplies 45V to T401 H- drive for CP785 FBT supplies 14V to I301 vertical IC FBT supplies 33V to the tuner FBT supplies 185V to I901 video amplifier pin 6
14.5V (CP785) 12.5V (CP385)	I602 sound amplifier pins 3-16	
11V	T401 H- drive	
8V	I501 Main IC pins 14-39	
	I601 Sound Demod pins 38-39-40	
6V	I703 IR receiver pin 1	
5V	I601 Sound Demod pins 7-18-57	
	I702 EEPROM pin 8	
	tuner	
3.3V	Main IC µcom part pins 54-56-61	

b) TV set on stand-by mode

* TV set circuit diagram on stand-by mode



Power supply operation in stand - by mode



I810 controlled rectifier switching circuit

* TV set stand-by mode operations

-On stand-by mode, I501 microcontroller pin 63 (power) is set to low.
- So, Q809 collector is set to high.
-Then, I810 controlled rectifier gate pin is set to high and I810 is conducting.
- So, current flows from pin 16 SMPS transformer to the ground via I804 optocoupler and Q810 and Q811 transistors (which are conducting).
- In these conditions, I801 delivers pulses on light mode and T801 produces voltages with reduced power.
- As I810 is conducting, current flows also from pin 16 SMPS transformer to I823 (3.3V regulator) for I501 µcom, IR receiver and front mask buttons supply voltage (then, remote control or front mask buttons can be activated to leave stand-by mode).

6 - Replacement parts list

LOC.	PART-CODE	PART-NAME	PART-DESCRIPTION	REMARK
ZZ100	DE48D3740A01	TRANSMITTER REMOCON	R-40A01	
ZZ110	DEPTACPWD267	ACCESSORY AS	DTA-21Y1L	
00010	DE486A716200	BATTERY	AAA 1.5V	
10000	DE48586054K1	MANUAL INSTRUCTION	DTM-2082CW	
M821	DE4858213800	BAG INSTRUCTION	L.D.P.E T0.05X250X400	
ZZ120	DEPTBCSHD234	COVER BACK AS	DTL-28G7F	
M211	DE4852151911	COVER BACK	HIPS BK	
M211D	DE4857817611	CLOTH BLACK	FELT 200X20X0.7	
M541	DE4855415800	SPEC PLATE	150ART P/E FILM (C/TV)	
ZZ130	DEPTPKCPD234	PACKING AS	DTL-28G7F	
M641	DE6520010100	STAPLE PIN	18M/M J D O	
M681	DE4856812400	BAND	18MM X 3M	
M801	DE4858054400	BOX CARTON	DW-3	
M811	DE4858187200	PAD	EPS 28G7	
M822	DE4858215600	BAG P.E	PE FOAM T0.5X1600X1270	
ZZ131	DE48519A5510	CRT GROUND NET	2801H-1015-2P	
ZZ132	DE58G0000103	COIL DEGAUSSING	DC-2701	
ZZ140	DEPTCACAD234	CABINET AS	DTL-28G7F	
M201A	DE4857818701	CLOTH BLACK	FELT T0.7 L=250 W=15	
M201B	DE4857818702	CLOTH BLACK	FELT T0.7 L=350 W=15	
M211A	DE7122401612	SCREW TAPPING	T2S TRS 4X16 MFZN BK	
M211B	DE7128301412	SCREW TAPPING	T2S WAS 3X14 BK	
M281	DE4852821701	DOOR	PC SMOG	
M352	DE97P4602700	CLAMP CORD	NYLON 66 BLK 5280N	
M391	DE4853951200	BRKT	EGI T1.0 + CLOTH BLACK	
M391A	DE7122401612	SCREW TAPPING	T2S TRS 4X16 MFZN BK	
M481	DE4854854101	BUTTON POWER	ABS BK	
M481A	DE4856716000	SPRING	SWPA PIE0.5	
M491	DE4854939901	BUTTON CTRL	ABS BK	
M491A	DE7128301212	SCREW TAPPING	T2S WAS 3X12 MFZN BK	
M501	DE4855059001	DECO CTRL	PVC T0.25	
M561	DE4855617401	MARK BRAND	AL (SILVER)	
M681	DE4856812001	TIE CABLE	NYLON66 DA100	
M683	DE4856816300	CLAMP WIRE	NYLON 6 (V0)	
M791	DE4857923300	DOOR LOCK	LA701(KIFCO)	
P405	DE4850706S21	CONNECTOR	35135-0620+YLT502+ULW=500	
SP01A	DE7122401212	SCREW TAPPING	T2S TRS 4X12 MFZN BLACK	
SP02A	DE7122401212	SCREW TAPPING	T2S TRS 4X12 MFZN BLACK	
V901	DE4859622160	CRT	A66EAK071X11	
V901A	DE4856215403	WASHER RUBBER	CR T3.0	
V901B	DE4856015800	SCREW CRT FIX	L=27	
ZZ133	DE48519B6110	CRT GROUND NET	DS-DW450T/A	

ZZ200	DEPTFMSJD234	MASK FRONT AS	DTL-28G7F		
M201	DE4852068011	MASK FRONT	HIPS BK		
ZZ202	DEPTSPPWD165	SPEAKER AS	DTL-28G2F		
P601A	DE4850704S30	CONNECTOR	YH025-04+35098+ULW=700		
SP01	DE4858311110	SPEAKER	12W 8 OHM SP-58126F		
SP02	DE4858311110	SPEAKER	12W 8 OHM SP-58126F		
ZZ290	DEPTMPMS0001	PCB MAIN MANUAL AS	DTE-28G2F		
10	DE2193100801	SOLDER BAR	SN:PB=63:37 3PI(NO FLUX)		
40	DE2291050314	FLUX SOLVENT	IM-1000		
20	DE2193011101	SOLDER WIRE	RS 60-1.2 1.6A		
30	DE2291050617P	FLUX SOLDER	CF-329D		
60	DE2291051001	FLUX KILLER	KFT-7		
C315	DECEXF2C470C	C ELECTRO	160V RUS 47MF (13X25) TP		
C402	DECMYH3C562J	C MYLAR	1.6KV 5600PF J (BUP)		
C404	DECMYH3C472J	C MYLAR	1.6KV 4700PF J (BUP)		
C408	DECMYT2G274J	C MYLAR	400V 0.27MF MKP		
C415	DECEXF2E479V	C ELECTRO	250V RSS 4.7MF (10X16)TP		
C430	DECCXB3D681K	C CERA	2KV B 680PF K (TAPPING)		
C431	DECMXB2G472J	C MYLAR	400V 4700PF J TP		
C440	DECMXE2G273J	C MYLAR	400V PU 0.027MF J (T		
C499	DECEYD1H689W	C ELECTRO	50V RHD 6.8MF (16X35.5)		
C604	DECEXF1E102V	C ELECTRO	25V RSS 1000MF (13X20) TP		
C801	DECL1SC3474M	C LINE ACROSS	275V 0.47MF		
C803	DECCXB3A472K	C CERA	1KV B 4700PF K (TAPPING)		
C804	DECCXB3A472K	C CERA	1KV B 4700PF K (TAPPING)		
C805	DECEYN2G181P	C ELECTRO	400V LHS 180MF (25X35)		
C810	DECBXB3D102K	C CERA SEMI	2KV BL(N) 1000PF K (T)		
C812	DECH1AFE472M	C CERA AC	4KV 4700PF M KX DE1610		
C813	DECEYF2E470V	C ELECTRO	250V RSS 47MF (16X25		
C814	DECEYF2E470V	C ELECTRO	250V RSS 47MF (16X25		
C820	DECCYR3A471K	C CERA	1KV 470PF K 125C		
C823	DECEXF1E102V	C ELECTRO	25V RSS 1000MF (13X20) TP		
C824	DECCYR3A471K	C CERA	1KV 470PF K 125C		
C831	DECCYR3A471K	C CERA	1KV 470PF K 125C		
C832	DECEXF1E102V	C ELECTRO	25V RSS 1000MF (13X20) TP		
C840	DECEXF1C222V	C ELECTRO	16V RSS 2200MF(13X25)TP		
C841	DECEXF1C222V	C ELECTRO	16V RSS 2200MF(13X25)TP		
C861	DECEXF1E102V	C ELECTRO	25V RSS 1000MF (13X20) TP		
C866	DECCYR3A471K	C CERA	1KV 470PF K 125C		
C905	DECEXF2E479V	C ELECTRO	250V RSS 4.7MF (10X16)TP		
C965	DECBXB3D102K	C CERA SEMI	2KV BL(N) 1000PF K (T)		
D100	DEDSML1216W	LED	SML1216W		
D403	DEDBY228	DIODE	BY228		
D404	DEDBYW76	DIODE	BYW76		
D820	DEDBYW76	DIODE	BYW76		
D860	DEDBYW76	DIODE	BYW76		
F801	DE5FSCB4022R	FUSE CERA	SEMKO F4AH 4A 250V MF51		
G900	DE4SG0D00103	SPARK GAP	S-23 900V-1.5KV		

HP1	DE4859102130	JACK EARPHONE	YSC-1537		
I301	DE1TDA8358J	IC VERTICAL	TDA8358J		
I301A	DE4857024422	HEAT SINK	I301A, I602A (CP-785)		
I301B	DE7174301011	SCREW TAPPTITE	TT2 RND 3X10 MFZN		
I501	DE4859302810	IC SOCKET	LSC-764-T051-00		
I601	DE1MSP3415D	IC RF	MSP-3415D		
I602	DE1TDA8946J	IC AUDIO	TDA8946J		
I602A	DE4857024422	HEAT SINK	I301A, I602A (CP-785)		
I602B	DE7174301011	SCREW TAPPTITE	TT2 RND 3X10 MFZN		
I702	DE1AT24C08PC	IC MEMORY	AT24C08-10PC		
I703	DE1TSOP1238W	IC PREAMP	TSOP1238WI1		
I801	DE1STRF6653	IC SMPS	STR-F6653		
I801A	DE4857024600	HEAT SINK	AL EX B/K		
I801B	DE7174300811	SCREW TAPPTITE	TT2 RND 3X8 MFZN		
I804	DE1LTV817C	IC PHOTO COUPLER	LTV-817C		
I806	DE1SE130N	IC	SE130N		
I810	DETX0202DA	THYRISTOR	X0202DA		
I820	DE1KA7805	IC REGULATOR	KA7805		
I822	DE1KA7808	IC REGULATOR	KA7808		
I823	DE1LE33CZ	IC REGULATOR	LE33CZ		
I901	DE1TDA6107Q	IC VIDEO	TDA6107Q		
I901A	DE4857031100	HEAT SINK	A1050P-H24 T2.0		
I901B	DE7174301011	SCREW TAPPTITE	TT2 RND 3X10 MFZN		
JPA1	DE4859200401	SOCKET RGB	SR-21A1 (ANGLE TYPE)		
JPA2	DE4859200401	SOCKET RGB	SR-21A1 (ANGLE TYPE)		
JPA3	DE4859108450	JACK PIN BOARD	YSC03P-4120-14A		
L401	DE58H0000025	COIL H-LINEARITY	TRL-330		
L402	DE58C7070085	COIL CHOKE	TLN-3062A		
L802	DE58C9430599	COIL CHOKE	AZ-9004Y(94MH)		
LF801	DE5PLF24A1	FILTER LINE	LF-24A1		
M351	DE4853533600	HOLDER LED	P.P BK		
P401	DE4850705N14	CONNECTOR	BIC-05T-25T+ULW=400		
P402	DE4859240120	CONN WAFER	YFW500-06		
P501	DE4850705N14	CONNECTOR	BIC-05T-25T+ULW=400		
P601	DE4859231720	CONN WAFER	YW025-04		
P702	DE4859231820	CONN WAFER	YW025-05		
P801	DE4859242220	CONN WAFER	YFW800-02		
P802	DE4859242220	CONN WAFER	YFW800-02		
P903	DE4859262120	CONN WAFER	YFW 800-01 A5MODELS		
Q401	DET2SD1880	TR	2SD1880		
Q401A	DE4857024500	HEAT SINK	AL EX		
Q401B	DE7174300811	SCREW TAPPTITE	TT2 RND 3X8 MFZN		
R399	DERS02Y120JS	R M-OXIDE FILM	2W 12 OHM J SMALL		
R406	DERS02Y471JS	R M-OXIDE FILM	2W 470 OHM J SMALL		
R415	DERS02Y102JS	R M-OXIDE FILM	2W 1K OHM J SMALL		
R450	DERS02Y223JS	R M-OXIDE FILM	2W 22K OHM J SMALL		
R801	DEDT120B8010	POSISTOR	T120-B80-A110		
R802	DERS02Y753JS	R M-OXIDE FILM	2W 75K OHM J SMALL		

R803	DERS02Y473JS	R M-OXIDE FILM	2W 47K OHM J SMALL
R804	DERF02Y228K	R FUSIBLE	2W 0.22 OHM K
R808	DERS02Y821JS	R M-OXIDE FILM	2W 820 OHM J SMALL
R819	DERX10B339JN	R CEMENT	10W 3.3 OHM J BENCH 4P
R920	DERF01Y109JA	R FUSIBLE	1W 1 OHM J A CURVE
SCT1	DE4859303630	SOCKET CRT	B8-288 METALLO
SF1	DE5PK3953M	FILTER SAW	K3953M
SF2	DE5PK9650M	FILTER SAW	K9650M
SW801	DE5S40101143	SW PUSH	PS3-22SP (P.C.B)
T401	DE50D19A1	TRANS DRIVE	TD-19A1
T402	DE50H0000205	FBT	1342.0026
T801	DE50M4936B1	TRANS SMPS	2094.0041
U100	DE4859719430	TUNER VARACTOR	EL2782-105-B
X502	DE5XE12R000E	CRYSTAL QUARTZ	HC-49/U 12.00000MHZ 30PPM
X601	DE5XE18R432E	CRYSTAL QUARTZ	HC-49/U 18.43200MHZ 30PPM
ZZ200	DEPTMPJR0001	PCB MAIN RADIAL AS	DTE-28G2F
C101	DECEXF1H100V	C ELECTRO	50V RSS 10MF (5X11) TP
C102	DECEXF1H470V	C ELECTRO	50V RSS 47MF (6.3*11) TP
C104	DECCXB1H102K	C CERA	50V B 1000PF K (TAPPING)
C106	DECEXF1E101V	C ELECTRO	25V RSS 100MF (6.3X11) TP
C120	DECCXB1H102K	C CERA	50V B 1000PF K (TAPPING)
C121	DECEXF1H100V	C ELECTRO	50V RSS 10MF (5X11) TP
C305	DECEXF1E221V	C ELECTRO	25V RSS 220MF (8X11.5) TP
C313	DECBXF1H104Z	C CERA SEMI	50V F 0.1MF Z (TAPPING)
C320	DECBXF1H104Z	C CERA SEMI	50V F 0.1MF Z (TAPPING)
C350	DECCXF1H473Z	C CERA	50V F 0.047MF Z (TAPPING)
C351	DECCXF1H473Z	C CERA	50V F 0.047MF Z (TAPPING)
C401	DECEXF1E101V	C ELECTRO	25V RSS 100MF (6.3X11) TP
C412	DECEXF2C339V	C ELECTRO	160V RSS 3.3MF (8X16) TP
C414	DECMXM2A104J	C MYLAR	100V 0.1MF J TP
C418	DECCXB1H102K	C CERA	50V B 1000PF K (TAPPING)
C420	DECCXB2H222K	C CERA	500V B 2200PF K (TAPPING)
C500	DECEXF1H478V	C ELECTRO	50V RSS 0.47MF (5X11) TP
C501	DECEXF1H100V	C ELECTRO	50V RSS 10MF (5X11) TP
C509	DECEXF1E470V	C ELECTRO	25V RSS 47MF (5X11) TP
C511	DECMXB1H224J	C MYLAR	50V EU 0.22MF J(TP)
C512	DECMXB1H224J	C MYLAR	50V EU 0.22MF J(TP)
C514	DECEXF1E101V	C ELECTRO	25V RSS 100MF (6.3X11) TP
C517	DECEXF1H109V	C ELECTRO	50V RSS 1MF (5X11) TP
C519	DECEXF1H109V	C ELECTRO	50V RSS 1MF (5X11) TP
C524	DECMXB1H104J	C MYLAR	50V EU 0.1MF J (TP)
C525	DECCXB1H102K	C CERA	50V B 1000PF K (TAPPING)
C526	DECMXB1H104J	C MYLAR	50V EU 0.1MF J (TP)
C527	DECMXM2A473J	C MYLAR	100V 0.047MF J TP
C528	DECEXF1E101V	C ELECTRO	25V RSS 100MF (6.3X11) TP
C530	DECEXF1E101V	C ELECTRO	25V RSS 100MF (6.3X11) TP
C531	DECCXF1H473Z	C CERA	50V F 0.047MF Z (TAPPING)

C532	DECEXF1H100V	C ELECTRO	50V RSS 10MF (5X11) TP		
C537	DECBXF1H104Z	C CERA SEMI	50V F 0.1MF Z (TAPPING)		
C540	DECEXF1H220V	C ELECTRO	50V RSS 22MF (5X11) TP		
C541	DECEXF1H220V	C ELECTRO	50V RSS 22MF (5X11) TP		
C542	DECEXF1H100V	C ELECTRO	50V RSS 10MF (5X11) TP		
C543	DECEXF1H100V	C ELECTRO	50V RSS 10MF (5X11) TP		
C550	DECEXF1H229V	C ELECTRO	50V RSS 2.2MF (5X11) TP		
C555	DECEXF1C470V	C ELECTRO	16V RSS 47MF (5X11) TP		
C560	DECBXF1H104Z	C CERA SEMI	50V F 0.1MF Z (TAPPING)		
C561	DECEXF1E101V	C ELECTRO	25V RSS 100MF (6.3X11) TP		
C564	DECEXF1E101V	C ELECTRO	25V RSS 100MF (6.3X11) TP		
C565	DECBXF1H104Z	C CERA SEMI	50V F 0.1MF Z (TAPPING)		
C585	DECCXB1H222K	C CERA	50V B 2200PF K (TAPPING)		
C590	DECXCH1H220J	C CERA	50V CH 22PF J (TAPPING)		
C591	DECXCH1H220J	C CERA	50V CH 22PF J (TAPPING)		
C592	DECBXF1H104Z	C CERA SEMI	50V F 0.1MF Z (TAPPING)		
C593	DECEXF1E101V	C ELECTRO	25V RSS 100MF (6.3X11) TP		
C601	DECCXB1H472K	C CERA	50V B 4700PF K (TAPPING)		
C602	DECEXF1H100V	C ELECTRO	50V RSS 10MF (5X11) TP		
C603	DECCXB1H472K	C CERA	50V B 4700PF K (TAPPING)		
C605	DECEXF1E470V	C ELECTRO	25V RSS 47MF (5X11) TP		
C608	DECEXF1H100V	C ELECTRO	50V RSS 10MF (5X11) TP		
C610	DECEXF1H100V	C ELECTRO	50V RSS 10MF (5X11) TP		
C611	DECEXF1H339V	C ELECTRO	50V RSS 3.3MF (5X11) TP		
C612	DECEXF1H109V	C ELECTRO	50V RSS 1MF (5X11) TP		
C613	DECEXF1H109V	C ELECTRO	50V RSS 1MF (5X11) TP		
C614	DECEXF1H109V	C ELECTRO	50V RSS 1MF (5X11) TP		
C615	DECEXF1H109V	C ELECTRO	50V RSS 1MF (5X11) TP		
C616	DECEXF1H100V	C ELECTRO	50V RSS 10MF (5X11) TP		
C617	DECBXF1H104Z	C CERA SEMI	50V F 0.1MF Z (TAPPING)		
C620	DECXCH1H509D	C CERA	50V CH 5PF D (TAPPING)		
C621	DECXCH1H509D	C CERA	50V CH 5PF D (TAPPING)		
C622	DECCXF1H223Z	C CERA	50V F 0.022MF Z (TAPPING)		
C625	DECEXF1H479V	C ELECTRO	50V RSS 4.7MF (5*11) TP		
C626	DECEXF1H479V	C ELECTRO	50V RSS 4.7MF (5*11) TP		
C629	DECBXF1H104Z	C CERA SEMI	50V F 0.1MF Z (TAPPING)		
C630	DECEXF1E470V	C ELECTRO	25V RSS 47MF (5X11) TP		
C631	DECBXF1H104Z	C CERA SEMI	50V F 0.1MF Z (TAPPING)		
C635	DECBXF1H104Z	C CERA SEMI	50V F 0.1MF Z (TAPPING)		
C636	DECEXF1H100V	C ELECTRO	50V RSS 10MF (5X11) TP		
C650	DECXCH1H470J	C CERA	50V CH 47PF J (TAPPING)		
C660	DECEXF1C101V	C ELECTRO	16V RSS 100MF (6.3X11) TP		
C661	DECMXB1H224J	C MYLAR	50V EU 0.22MF J(TP)		
C662	DECMXB1H224J	C MYLAR	50V EU 0.22MF J(TP)		
C665	DECCXB1H472K	C CERA	50V B 4700PF K (TAPPING)		
C666	DECBXF1H104Z	C CERA SEMI	50V F 0.1MF Z (TAPPING)		
C667	DECCXB1H472K	C CERA	50V B 4700PF K (TAPPING)		
C668	DECMXB1H224J	C MYLAR	50V EU 0.22MF J(TP)		

C669	DECMXB1H224J	C MYLAR	50V EU 0.22MF J(TP)		
C690	DECEXF1H479V	C ELECTRO	50V RSS 4.7MF (5*11) TP		
C691	DECEXF1H479V	C ELECTRO	50V RSS 4.7MF (5*11) TP		
C770	DECEXF1E101V	C ELECTRO	25V RSS 100MF (6.3X11) TP		
C806	DECEXF1H330V	C ELECTRO	50V RSS 33MF (6.3X11) TP		
C807	DECCXF1H473Z	C CERA	50V F 0.047MF Z (TAPPING)		
C808	DECEXF1H479V	C ELECTRO	50V RSS 4.7MF (5*11) TP		
C821	DECCXB1H102K	C CERA	50V B 1000PF K (TAPPING)		
C835	DECEXF1H470V	C ELECTRO	50V RSS 47MF (6.3*11) TP		
C844	DECEXF1E101V	C ELECTRO	25V RSS 100MF (6.3X11) TP		
C863	DECEXF1E101V	C ELECTRO	25V RSS 100MF (6.3X11) TP		
C888	DECEXF1C470V	C ELECTRO	16V RSS 47MF (5X11) TP		
C910	DECCXB1H152K	C CERA	50V B 1500PF K (TAPPING)		
C950	DECEXF1C101V	C ELECTRO	16V RSS 100MF (6.3X11) TP		
C968	DECMXL2E104K	C MYLAR	250V 0.1MF K MEU TP		
CA10	DECCXB1H102K	C CERA	50V B 1000PF K (TAPPING)		
F801A	DE4857415001	CLIP FUSE	PFC5000-0702		
F801B	DE4857415001	CLIP FUSE	PFC5000-0702		
I805	DE1UPC574J	IC	UPC574J		
Q101	DETSTC1740Y	TR	STC1740-Y		
Q103	DETKTC3202Y	TR	KTC3202Y		
Q402	DET2SD1207T	TR	2SD1207-T (TAPPING)		
Q501	DETSTA933Y	TR	STA933-Y		
Q502	DETSTC1740Y	TR	STC1740-Y		
Q503	DETSTC1740Y	TR	STC1740-Y		
Q504	DETSTC1740Y	TR	STC1740-Y		
Q505	DETSTC1740Y	TR	STC1740-Y		
Q507	DETSTA933Y	TR	STA933-Y		
Q508	DETSTC1740Y	TR	STC1740-Y		
Q509	DETSTA933Y	TR	STA933-Y		
Q510	DETSTA933Y	TR	STA933-Y		
Q511	DETSTA933Y	TR	STA933-Y		
Q807	DETSTC1740Y	TR	STC1740-Y		
Q808	DETSTC1740Y	TR	STC1740-Y		
Q809	DETSTC1740Y	TR	STC1740-Y		
Q810	DETSTC1740Y	TR	STC1740-Y		
Q811	DETSTC1740Y	TR	STC1740-Y		
Q950	DETSTC1740Y	TR	STC1740-Y		
SW700	DE5S50101090	SW TACT	SKHV17910A		
SW701	DE5S50101090	SW TACT	SKHV17910A		
SW702	DE5S50101090	SW TACT	SKHV17910A		
SW703	DE5S50101090	SW TACT	SKHV17910A		
SW704	DE5S50101090	SW TACT	SKHV17910A		
Z501	DE5PXPS5R5MB	FILTER CERA	TPS5.5MB-TF21 TAPING		
Z601	DE5PXF1B471M	FILTER EMI	CFI 06 B 1H 470PF		
Z602	DE5PXF1B471M	FILTER EMI	CFI 06 B 1H 470PF		
Z603	DE5PXF1B471M	FILTER EMI	CFI 06 B 1H 470PF		
Z604	DE5PXF1B471M	FILTER EMI	CFI 06 B 1H 470PF		

Z605	DE5PXF1B471M	FILTER EMI	CFI 06 B 1H 470PF	
Z606	DE5PXF1B471M	FILTER EMI	CFI 06 B 1H 470PF	
Z607	DE5PXF1B471M	FILTER EMI	CFI 06 B 1H 470PF	
Z608	DE5PXF1B471M	FILTER EMI	CFI 06 B 1H 470PF	
Z609	DE5PXF1B471M	FILTER EMI	CFI 06 B 1H 470PF	
Z610	DE5PXF1B471M	FILTER EMI	CFI 06 B 1H 470PF	
ZZ200	DEPTMPJA0001	PCB MAIN AXIAL AS	DTE-28G2F	
10	DE2TM14006LB	TAPE MASKING	3M #232 6.0X2000M	
A001	DE4859803393	PCB MAIN	CP-785	
C103	DECCZB1H102K	C CERA	50V B 1000PF K (AXIAL)	
C108	DECCZB1H101K	C CERA	50V B 100PF K (AXIAL)	
C110	DECCZB1H102K	C CERA	50V B 1000PF K (AXIAL)	
C513	DECBZF1H104Z	C CERA SEMI	50V F 0.1MF Z (AXIAL)	
C515	DECBZR1C222M	C CERA	Y5R 16V 2200PF M AXIAL	
C516	DECBZR1C472M	C CERA	Y5R 16V 4700PF M AXIAL	
C518	DECBZF1H104Z	C CERA SEMI	50V F 0.1MF Z (AXIAL)	
C520	DECCZB1H102K	C CERA	50V B 1000PF K (AXIAL)	
C521	DECCZB1H102K	C CERA	50V B 1000PF K (AXIAL)	
C523	DECBZF1H104Z	C CERA SEMI	50V F 0.1MF Z (AXIAL)	
C529	DECBZF1H104Z	C CERA SEMI	50V F 0.1MF Z (AXIAL)	
C533	DECCZB1H102K	C CERA	50V B 1000PF K (AXIAL)	
C534	DECCZF1H223Z	C CERA	50V F 0.022MF Z	
C535	DECCZF1H223Z	C CERA	50V F 0.022MF Z	
C536	DECCZF1H223Z	C CERA	50V F 0.022MF Z	
C577	DECCZB1H561K	C CERA	50V B 560PF K (AXIAL)	
C587	DECCZB1H101K	C CERA	50V B 100PF K (AXIAL)	
C588	DECCZB1H101K	C CERA	50V B 100PF K (AXIAL)	
C589	DECCZB1H101K	C CERA	50V B 100PF K (AXIAL)	
C695	DECZCH1H470J	C CERA	50V CH 47PF (AXIAL)	
C696	DECZCH1H470J	C CERA	50V CH 47PF (AXIAL)	
C771	DECBZF1H104Z	C CERA SEMI	50V F 0.1MF Z (AXIAL)	
C809	DECCZB1H101K	C CERA	50V B 100PF K (AXIAL)	
C830	DECBZF1H104Z	C CERA SEMI	50V F 0.1MF Z (AXIAL)	
C850	DECCZB1H821K	C CERA	50V B 820PF K (AXIAL)	
CA01	DECCZB1H101K	C CERA	50V B 100PF K (AXIAL)	
CA02	DECCZB1H101K	C CERA	50V B 100PF K (AXIAL)	
CA03	DECCZB1H101K	C CERA	50V B 100PF K (AXIAL)	
D101	DEDBAT85	DIODE	BAT85 (TAPPING)	
D102	DED1SS85TA	DIODE	1SS85TA	
D313	DEDBAV21	DIODE	BAV21 (TAPPING)	
D405	DEDRGP15J	DIODE	RGP15J	
D407	DEDRGP15J	DIODE	RGP15J	
D408	DEDRGP15J	DIODE	RGP15J	
D410	DED1N4003	DIODE	1N4003 (TAPPING)	
D411	DED1N4003	DIODE	1N4003 (TAPPING)	
D450	DEDRGP15J	DIODE	RGP15J	
D520	DED1N4148	DIODE	1N4148 (TAPPING)	
D521	DED1N4148	DIODE	1N4148 (TAPPING)	

D591	DEDUZ2R4B	DIODE ZENER	UZ-2.4B		
D710	DEDTZX5V1B	DIODE ZENER	TZX5V1B (TAPPING)		
D801	DEDBYT51J	DIODE	BYT51J (TAPPING)		
D802	DEDBYT51J	DIODE	BYT51J (TAPPING)		
D803	DEDBYT51J	DIODE	BYT51J (TAPPING)		
D804	DEDBYT51J	DIODE	BYT51J (TAPPING)		
D805	DEDRGP15J	DIODE	RGP15J		
D806	DEDRGP15J	DIODE	RGP15J		
D808	DEDRGP15J	DIODE	RGP15J		
D809	DEDRGP15J	DIODE	RGP15J		
D810	DEDRGP15J	DIODE	RGP15J		
D811	DEDTZX5V6B	DIODE ZENER	TZX5V6B (TAPPING)		
D821	DEDRGP15J	DIODE	RGP15J		
D822	DEDTZX9V1B	DIODE ZENER	TZX9V1B (TAPPING)		
D824	DED1N4148	DIODE	1N4148 (TAPPING)		
D825	DED1N4148	DIODE	1N4148 (TAPPING)		
D830	DEDRGP15J	DIODE	RGP15J		
D831	DEDRGP15J	DIODE	RGP15J		
D840	DED1N4148	DIODE	1N4148 (TAPPING)		
D841	DED1N4148	DIODE	1N4148 (TAPPING)		
D904	DEDBAV21	DIODE	BAV21 (TAPPING)		
D905	DEDBAV21	DIODE	BAV21 (TAPPING)		
D906	DEDBAV21	DIODE	BAV21 (TAPPING)		
D951	DED1N4148	DIODE	1N4148 (TAPPING)		
D952	DED1N4148	DIODE	1N4148 (TAPPING)		
D953	DED1N4148	DIODE	1N4148 (TAPPING)		
D954	DED1N4148	DIODE	1N4148 (TAPPING)		
DA01	DED1N4148	DIODE	1N4148 (TAPPING)		
DA02	DEDTZX5V6B	DIODE ZENER	TZX5V6B (TAPPING)		
DA03	DEDTZX5V1B	DIODE ZENER	TZX5V1B (TAPPING)		
DA04	DEDTZX5V6B	DIODE ZENER	TZX5V6B (TAPPING)		
DA06	DEDTZX5V6B	DIODE ZENER	TZX5V6B (TAPPING)		
DA08	DEDTZX5V6B	DIODE ZENER	TZX5V6B (TAPPING)		
DA09	DEDTZX5V6B	DIODE ZENER	TZX5V6B (TAPPING)		
DA10	DEDTZX5V6B	DIODE ZENER	TZX5V6B (TAPPING)		
DA11	DEDTZX5V6B	DIODE ZENER	TZX5V6B (TAPPING)		
DA13	DEDTZX5V6B	DIODE ZENER	TZX5V6B (TAPPING)		
DA14	DEDTZX5V6B	DIODE ZENER	TZX5V6B (TAPPING)		
DA15	DEDTZX5V6B	DIODE ZENER	TZX5V6B (TAPPING)		
DA16	DEDTZX5V6B	DIODE ZENER	TZX5V6B (TAPPING)		
DA20	DEDTZX5V6B	DIODE ZENER	TZX5V6B (TAPPING)		
DA23	DEDTZX5V6B	DIODE ZENER	TZX5V6B (TAPPING)		
DA24	DEDTZX5V6B	DIODE ZENER	TZX5V6B (TAPPING)		
DA27	DEDTZX5V6B	DIODE ZENER	TZX5V6B (TAPPING)		
J001	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J002	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J003	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J004	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		

J005	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J006	DE5CPZ100K02	COIL PEAKING	10UH 3.5MM K (LAL02TB)		
J007	DE5CPZ100K02	COIL PEAKING	10UH 3.5MM K (LAL02TB)		
J008	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J009	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J010	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J011	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J012	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J013	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J014	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J015	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J016	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J017	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J018	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J019	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J020	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J021	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J022	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J023	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J024	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J025	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J026	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J027	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J028	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J029	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J030	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J031	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J032	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J034	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J035	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J036	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J037	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J039	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J040	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J041	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J042	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J043	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J044	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J045	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J046	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J047	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J048	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J049	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J050	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J051	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J052	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J053	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J054	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		

J055	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J056	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J057	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J058	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J059	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J060	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J061	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J062	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J063	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J065	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J066	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J067	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J068	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J070	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J071	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J072	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J073	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J075	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J079	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J080	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J090	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J098	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J099	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J100	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J816	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
J826	DE85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING		
L101	DE5CPZ100K02	COIL PEAKING	10UH 3.5MM K (LAL02TB)		
L500	DE5CPZ120K02	COIL PEAKING	12UH 3.5MM K (LAL02TB)		
L501	DE5CPZ100K02	COIL PEAKING	10UH 3.5MM K (LAL02TB)		
L502	DE5CPZ100K02	COIL PEAKING	10UH 3.5MM K (LAL02TB)		
L510	DE5CPZ100K02	COIL PEAKING	10UH 3.5MM K (LAL02TB)		
L511	DE5CPZ100K02	COIL PEAKING	10UH 3.5MM K (LAL02TB)		
L512	DE5CPZ100K02	COIL PEAKING	10UH 3.5MM K (LAL02TB)		
L601	DE5CPZ479K02	COIL PEAKING	4.7UH 3.5MM K (LAL02TB)		
L602	DE5CPZ479K02	COIL PEAKING	4.7UH 3.5MM K (LAL02TB)		
L603	DE5CPZ479K02	COIL PEAKING	4.7UH 3.5MM K (LAL02TB)		
L650	DE5MC0000100	COIL BEAD	MD-5 (HC-3550)		
L801	DE5MC0000100	COIL BEAD	MD-5 (HC-3550)		
L803	DE5MC0000100	COIL BEAD	MD-5 (HC-3550)		
R101	DERDAZ473J	R CARBON FILM	1/6 47K OHM J		
R102	DERDAZ472J	R CARBON FILM	1/6 4.7K OHM J		
R103	DERDAZ123J	R CARBON FILM	1/6 12K OHM J		
R104	DERDAZ104J	R CARBON FILM	1/6 100K OHM J		
R105	DERDAZ392J	R CARBON FILM	1/6 3.9K OHM J		
R106	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R107	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R113	DERDAZ562J	R CARBON FILM	1/6 5.6K OHM J		
R114	DERDAZ562J	R CARBON FILM	1/6 5.6K OHM J		

R115	DERDAZ682J	R CARBON FILM	1/6 6.8K OHM J		
R116	DERDAZ222J	R CARBON FILM	1/6 2.2K OHM J		
R117	DERDAZ222J	R CARBON FILM	1/6 2.2K OHM J		
R120	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R310	DERDAZ102J	R CARBON FILM	1/6 1K OHM J		
R311	DERDAZ102J	R CARBON FILM	1/6 1K OHM J		
R330	DERD2Z101J	R CARBON FILM	1/2 100 OHM J		
R331	DERD2Z101J	R CARBON FILM	1/2 100 OHM J		
R340	DERD4Z473J	R CARBON FILM	1/4 47K OHM J		
R350	DERN4Z2001F	R METAL FILM	1/4 2.0K OHM F		
R351	DERN4Z2001F	R METAL FILM	1/4 2.0K OHM F		
R394	DERDAZ272J	R CARBON FILM	1/6 2.7K OHM J		
R395	DERD4Z394J	R CARBON FILM	1/4 390K OHM J		
R396	DERDAZ272J	R CARBON FILM	1/6 2.7K OHM J		
R397	DERDAZ823J	R CARBON FILM	1/6 82K OHM J		
R398	DERD2Z828J	R CARBON FILM	1/2 0.82 OHM J		
R401	DERD4Z272J	R CARBON FILM	1/4 2.7K OHM J		
R402	DERD4Z220J	R CARBON FILM	1/4 22 OHM J		
R404	DERD4Z399J	R CARBON FILM	1/4 3.9 OHM J		
R420	DERDAZ473J	R CARBON FILM	1/6 47K OHM J		
R501	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R502	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R503	DERDAZ332J	R CARBON FILM	1/6 3.3K OHM J		
R504	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R505	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R506	DERDAZ332J	R CARBON FILM	1/6 3.3K OHM J		
R507	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R508	DERDAZ332J	R CARBON FILM	1/6 3.3K OHM J		
R509	DERDAZ681J	R CARBON FILM	1/6 680 OHM J		
R512	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R513	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R514	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R515	DERDAZ153J	R CARBON FILM	1/6 15K OHM J		
R516	DERDAZ393J	R CARBON FILM	1/6 39K OHM J		
R517	DERDAZ102J	R CARBON FILM	1/6 1K OHM J		
R518	DERDAZ273J	R CARBON FILM	1/6 27K OHM J		
R520	DERDAZ333J	R CARBON FILM	1/6 33K OHM J		
R521	DERDAZ391J	R CARBON FILM	1/6 390 OHM J		
R522	DERDAZ221J	R CARBON FILM	1/6 220 OHM J		
R523	DERDAZ331J	R CARBON FILM	1/6 330 OHM J		
R524	DERDAZ561J	R CARBON FILM	1/6 560 OHM J		
R525	DERDAZ104J	R CARBON FILM	1/6 100K OHM J		
R526	DERD4Z479J	R CARBON FILM	1/4 4.7 OHM J		
R527	DERDAZ431J	R CARBON FILM	1/6 430 OHM J		
R528	DERDAZ221J	R CARBON FILM	1/6 220 OHM J		
R530	DERDAZ470J	R CARBON FILM	1/6 47 OHM J		
R531	DERDAZ102J	R CARBON FILM	1/6 1K OHM J		
R533	DERDAZ103J	R CARBON FILM	1/6 10K OHM J		

R534	DERDAZ102J	R CARBON FILM	1/6 1K OHM J		
R537	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R538	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R539	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R540	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R541	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R542	DERDAZ472J	R CARBON FILM	1/6 4.7K OHM J		
R543	DERDAZ472J	R CARBON FILM	1/6 4.7K OHM J		
R544	DERDAZ221J	R CARBON FILM	1/6 220 OHM J		
R545	DERDAZ682J	R CARBON FILM	1/6 6.8K OHM J		
R546	DERDAZ472J	R CARBON FILM	1/6 4.7K OHM J		
R547	DERDAZ103J	R CARBON FILM	1/6 10K OHM J		
R548	DERDAZ472J	R CARBON FILM	1/6 4.7K OHM J		
R549	DERD4Z472J	R CARBON FILM	1/4 4.7K OHM J		
R550	DERDAZ472J	R CARBON FILM	1/6 4.7K OHM J		
R551	DERDAZ221J	R CARBON FILM	1/6 220 OHM J		
R555	DERDAZ103J	R CARBON FILM	1/6 10K OHM J		
R556	DERDAZ562J	R CARBON FILM	1/6 5.6K OHM J		
R567	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R570	DERDAZ102J	R CARBON FILM	1/6 1K OHM J		
R580	DERDAZ561J	R CARBON FILM	1/6 560 OHM J		
R585	DERDAZ224J	R CARBON FILM	1/6 220K OHM J		
R586	DERDAZ221J	R CARBON FILM	1/6 220 OHM J		
R587	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R588	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R589	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R591	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R592	DERDAZ103J	R CARBON FILM	1/6 10K OHM J		
R593	DERDAZ103J	R CARBON FILM	1/6 10K OHM J		
R594	DERDAZ103J	R CARBON FILM	1/6 10K OHM J		
R595	DERDAZ473J	R CARBON FILM	1/6 47K OHM J		
R599	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R605	DERDAZ751J	R CARBON FILM	1/6 750 OHM J		
R606	DERDAZ751J	R CARBON FILM	1/6 750 OHM J		
R608	DERD2Z151J	R CARBON FILM	1/2 150 OHM J		
R609	DERD2Z151J	R CARBON FILM	1/2 150 OHM J		
R610	DERDAZ102J	R CARBON FILM	1/6 1K OHM J		
R614	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R615	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R620	DERDAZ102J	R CARBON FILM	1/6 1K OHM J		
R621	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R622	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R650	DERDAZ682J	R CARBON FILM	1/6 6.8K OHM J		
R660	DERDAZ682J	R CARBON FILM	1/6 6.8K OHM J		
R661	DERDAZ822J	R CARBON FILM	1/6 8.2K OHM J		
R662	DERDAZ822J	R CARBON FILM	1/6 8.2K OHM J		
R700	DERD2Z332J	R CARBON FILM	1/2 3.3K OHM J		
R710	DERDAZ431J	R CARBON FILM	1/6 430 OHM J		

R711	DERDAZ431J	R CARBON FILM	1/6 430 OHM J		
R713	DERDAZ681J	R CARBON FILM	1/6 680 OHM J		
R720	DERDAZ122J	R CARBON FILM	1/6 1.2K OHM J		
R721	DERDAZ181J	R CARBON FILM	1/6 180 OHM J		
R722	DERDAZ221J	R CARBON FILM	1/6 220 OHM J		
R723	DERDAZ331J	R CARBON FILM	1/6 330 OHM J		
R724	DERDAZ471J	R CARBON FILM	1/6 470 OHM J		
R805	DERD2Z100J	R CARBON FILM	1/2 10 OHM J		
R806	DERD4Z472J	R CARBON FILM	1/4 4.7K OHM J		
R807	DERD2Z332J	R CARBON FILM	1/2 3.3K OHM J		
R810	DERD4Z102J	R CARBON FILM	1/4 1K OHM J		
R811	DERC2Z565KP	R CARBON COMP	1/2 5.6M OHM K		
R817	DERDAZ473J	R CARBON FILM	1/6 47K OHM J		
R820	DERDAZ102J	R CARBON FILM	1/6 1K OHM J		
R821	DERD4Z102J	R CARBON FILM	1/4 1K OHM J		
R823	DERD2Z512J	R CARBON FILM	1/2 5.1K OHM J		
R829	DERDAZ223J	R CARBON FILM	1/6 22K OHM J		
R830	DERDAZ332J	R CARBON FILM	1/6 3.3K OHM J		
R840	DERD4Z220J	R CARBON FILM	1/4 22 OHM J		
R841	DERD2Z479J	R CARBON FILM	1/2 4.7 OHM J		
R850	DERD2Z479J	R CARBON FILM	1/2 4.7 OHM J		
R870	DERD2Z222J	R CARBON FILM	1/2 2.2K OHM J		
R888	DERDAZ103J	R CARBON FILM	1/6 10K OHM J		
R910	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R911	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R912	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
R913	DERC2Z102K	R CARBON COMP	1/2 1K OHM K		
R914	DERC2Z102K	R CARBON COMP	1/2 1K OHM K		
R915	DERC2Z102K	R CARBON COMP	1/2 1K OHM K		
R921	DERDAZ472J	R CARBON FILM	1/6 4.7K OHM J		
R922	DERDAZ472J	R CARBON FILM	1/6 4.7K OHM J		
R923	DERDAZ472J	R CARBON FILM	1/6 4.7K OHM J		
R951	DERD4Z244J	R CARBON FILM	1/4 240K OHM J		
R952	DERD4Z123J	R CARBON FILM	1/4 12K OHM J		
R953	DERDAZ153J	R CARBON FILM	1/6 15K OHM J		
R954	DERDAZ223J	R CARBON FILM	1/6 22K OHM J		
R955	DERDAZ223J	R CARBON FILM	1/6 22K OHM J		
RA01	DERDAZ680J	R CARBON FILM	1/6 68 OHM J		
RA02	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
RA03	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
RA04	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
RA05	DERDAZ682J	R CARBON FILM	1/6 6.8K OHM J		
RA06	DERDAZ750J	R CARBON FILM	1/6 75 OHM J		
RA08	DERDAZ750J	R CARBON FILM	1/6 75 OHM J		
RA09	DERDAZ750J	R CARBON FILM	1/6 75 OHM J		
RA10	DERDAZ101J	R CARBON FILM	1/6 100 OHM J		
RA11	DERDAZ680J	R CARBON FILM	1/6 68 OHM J		
RA12	DERDAZ680J	R CARBON FILM	1/6 68 OHM J		

RA16	DERDAZ680J	R CARBON FILM	1/6 68 OHM J	
RA19	DERDAZ750J	R CARBON FILM	1/6 75 OHM J	
RA20	DERDAZ473J	R CARBON FILM	1/6 47K OHM J	
RA21	DERDAZ473J	R CARBON FILM	1/6 47K OHM J	
RA40	DERDAZ101J	R CARBON FILM	1/6 100 OHM J	
RA41	DERDAZ101J	R CARBON FILM	1/6 100 OHM J	
RA44	DERDAZ682J	R CARBON FILM	1/6 6.8K OHM J	

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